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FHA GETS GOING

As bankers, buyers and builders push insured loans for machinery modernization under $50,000 provision

K. H. CONDIT
Editor

MACHINERY modernization is being stimulated by FHA insured loans. Big and little banks and intermediate credit financing houses are pushing them. Wise buyers are conserving cash resources and borrowing the money to obtain needed replacement equipment that pays for itself before the period of the loan expires. A few machinery builders have grasped

the advantages of increasing their sales by this means and their salesmen are going places.

Why has the acceptance of the FHA insured modernization loan been so reluctant? Is there something wrong with the principle involved?

These were the questions that bothered James A. Moffett, first head of the FHA, up to the time he resigned to return to private business. In his article published nearly a year ago (*AM*—Vol. 79, page 1) he outlined the idea and listed the reasons for undertaking it. A few months later the old $2,000 limit was boosted to $50,000, and the coverage was broadened to include every type of machine that was not readily removable.

This move looked like the one industry had been crying for since the middle of the Hoover administration but it was met with the friendly warmth of a January blizzard. Most of the applicants for insured loans for machinery were one jump ahead of the sheriff. Most of the banks had been so thoroughly "melted" by persistent demands for liquidity, which they had passed on with interest to their customers, that they had forgotten there was such a thing as a long term loan. Most of the equipment makers were so doggedly determined to be against anything that the Roosevelt administration sponsored that they gave the matter scant consideration. Had they realized that the whole plan was developed by George Houston, Ogden Mills and Eugene Meyer during Hoover's term and only abandoned then because of the bank crisis, perhaps they would have felt differently about it.

Besides, the insured modernization loan represented something new and different in the way of financing equipment sales, and therefore was resisted with the customary human objection to any divergence from accepted methods. The few manufacturers who decided to go ahead with the plan found it a tough job to educate their salesmen to handle it. One of the things required of a buyer is a credit statement. To the average salesman anything involving credit is mysterious and belongs in the province of the credit department. Some of them were convinced that it would be an insult to ask a prospective customer for a credit statement, and it took some educating to overcome this resistance.

At FHA headquarters in Washington the more philosophical officials remind you that it took quite a few months to get the original small building modernization loans under way, yet they are piling up a very respectable volume of business now. These men feel that there is every reason to

believe that the machinery loans will follow the same course. Developments of the last 60 days indicate that they are right.

Let's look at these loans from the banker's viewpoint. After he qualifies as an approved lending agency with FHA he can not only get insurance for 20 per cent of every loan he makes, but also for 20 per cent of the total of all loans. Thus, if one loan goes bad, he can recover the full amount in insurance provided the sum is not more than 20 per cent of the total loans outstanding. Years of experience with this sort of loan indicate a probable loss of not more than 1 or 2 per cent.

Furthermore, he is not limited by anything except the maximum figures set by FHA—5 years for the term and a discount of 5 per cent per year (or 9.7+ per cent interest) on a 5-year loan. If he chooses he can set a shorter term or a lower rate, or both, depending on the circumstances.

In addition the Comptroller of the Currency has ruled that FHA insured loans are to be considered as liquid assets when a bank is being examined. What could be sweeter—with money bringing the microscopic returns it does today in the open market?

Thousands of banks throughout the country have qualified under the FHA regulations. Three months ago FHA published a list of them in a book of more than 200 pages. Many more have qualified since. The average bank, it must be admitted, waits until an application is received before it starts to function, but there are exceptions.

A bank in Bangor, Maine, for instance, has retained an industrial engineer to investigate and report on industrial organizations within its territory that should be considered favorably as credit risks. The object, of course, is to stir up business for the bank.

The Manufacturers Trust Company of New York has a large force of solicitors out seeking modernization loan prospects. Portions of its short prospectus on the smaller loans are shown in one of the panels illustrating this article.

The Commercial Investment Trust Incorporated, of New York and Chicago, with years of successful experience in the financing of durable goods, domestic and industrial, has formed a subsidiary to handle FHA insured loans. Bancredit Corporation of St. Paul with branches in many cities is going after the business aggressively.

Extension Possible

Bankers in general, and commercial credit units in particular, are probably aware of the advantage that will accrue to them if and when the government withdraws and leaves the field to those qualified by experience to carry on. Under the present law loans will be insured up to April 1, 1936. It is possible, of course, that Congress will extend this date if the FHA is thought to be performing a useful service.

As stated above, the buyer or the borrower—the same fellow in this case—has been exceedingly coy toward the publicity sirens of FHA. The outstanding exception, until lately, has been the fellow who was down to the last dollar and hoped to get credit in this way that he could get nowhere else. He has been disappointed, of course, because all FHA insured loans are based largely on the credit statement the borrower can present as evidence of ability to repay.

For those potential buyers whose business is in such shape that they represent a respectable risk a credit statement that will meet the requirements is not a very difficult thing to fill out. A short form is required for loans up to $2,000, a somewhat more comprehensive one for loans above that figure and up to the top limit, $50,000.

MODERNIZATION CREDIT PLAN

Modernization Credits are extended by Manufacturers Trust Company to cover the purchase of all equipment defined as eligible by the Federal Housing Administration. This comprises equipment for business establishments as well as for home. Loans are extended by our Personal Loan Department up to $6,000, for periods of from one to three years. The discount rate is 5% per annum, and there is no investigation charge or any other extra expense. Repayments are made in the form of monthly deposits to a Special Interest Account in this bank, which receive interest, compounded quarterly. This interest is credited to the borrower, and serves to reduce the cost of the loan.

By making it possible for the consumer to finance his purchases at the lowest cost, our Modernization Credit Plan serves to broaden the market for business and home equipment, and to provide enterprising firms with unprecedented opportunities for increased sales.

Advantages to Equipment Manufacturers and Dealers

For manufacturers and dealers in the type of equipment and supplies considered eligible, our Modernization Credit Plan means increased sales, cash payment and the entire elimination of credit problems. Manufacturers Trust Company investigates the prospective buyer, and when the loan is approved, remits the full purchase price of the equipment to the seller. This bank assumes responsibility for the credit risk, so that as far as the manufacturer or dealer is concerned, it is a cash sale without recourse.

Operation of the Plan

In actual practice, the customer is asked to fill out a simple credit statement. A supply of these statements may be obtained from any one of the 56 offices of Manufacturers Trust Company in Manhattan, Brooklyn, Bronx and Queens. After this statement has been made out, it is delivered to the nearest office of our bank. As soon as the credit is approved, our Personal Loan Department mails a check to the seller. Decisions are generally rendered within forty-eight hours.

Loans in Excess of $6,000

Modernization Credits are also extended in amounts in excess of $6,000 and up to $50,000. The procedure for such larger loans, however, is slightly different from that described here. Full information about loans of this character may be obtained at any office of our institution.

Advantages of Modernization Credit Plan to the Customer

5% discount per annum.
No investigation charge.
Repayments in one to three years.
Interest on monthly payments credited to customer.
Liberal credits.
Prompt service.
No down payments.

Who May Qualify

This service is available to any individual, partnership or corporation with a steady income from salary, business, commission or other assured source. It is not necessary that applicants be depositors of this bank or of any other bank. Co-makers are not required.

A Typical Transaction

Let us suppose that the cost of the equipment to be purchased amounts to $400, and that the buyer would like to pay for it over a period of a year.

He would therefore be asked to make out a note for $421.05
Discount at 5% amounts to..... 21.05
Net proceeds to be remitted to seller... 400.00

To repay the loan, the borrower makes twelve equal monthly deposits. These deposits are placed in a Special Interest Account in our bank, and the interest is credited to the borrower. At the end of the year, this interest will amount to $3.86, so that the original discount of $21.05 is actually reduced to $17.19. Here we have an actual example of the exceptionally low cost of financing under this Plan.

Typical of the kind of company that has recently gladdened the hearts of the FHA officials by taking advantage of insured loans for equipment modernization is the Gisholt Machine Company which recently financed part of the modernization of its power plant in this fashion. The new boilers, which supply both heat and power for the big Gisholt plant, will save approximately $10,000 a year on the heat and power bill. One reason for handling the project by insured loan was that it permitted the management to keep its working capital undisturbed.

The Gisholt management is simply taking its own medicine in this instance, because it was one of the first to instruct its sales force to sell on the basis of insured loans where ready cash was hard to find. Results have been gratifying.

An Aid in Selling

Another company in this part of the country, the Lawrence M. Stein Company of Chicago, has had some success in selling laundry and cleaning machinery by the grace of FHA loan insurance. Ten deals totaling $25,000 have been closed in the last few weeks, and others amounting to between $25,000 and $30,000 are pending. The Chicago office of the Buda Company reports the FHA financed sale of three motor generator sets to one company, amount involved—$21,000.

Back East the Worthington Pump & Machinery Company jumped in at the very beginning when this type of financing became available and developed a plan, in cooperation with several of the national intermediate credit companies, to finance the sales of its products. The going was slow at first but it has been accelerating nicely of late. Many sales have been made that never would have materialized on the old basis. An abstract from the Worthington promotion matter is printed here to indicate the approach.

Further evidence of the way in which FHA insured loans are gathering momentum was given in an address made before the National Machine Tool Builders' Association last month by S. D. Maddock, vice-president, Commercial Investment Trust Incorporated. Mr. Maddock said, in part:

"The volume of business (and we have only been at it four weeks) has been constantly on the up, until today there is flowing through our offices about $20,000 of this business a day and it has just taken on its impetus. I have no doubt that before another ten days we will be passing through $50,000 more a day. I might add that more than 150 of the leading manufacturers of this country in the last four weeks have seen fit, just with our own company, to decide to use this operation, and they have put their indorsement at least on these rates.

"The finance charges are those stipulated by the FHA and are the lowest ever offered for general use. To give you an idea of what those finance charges amount to, on transactions carrying interest at 6 per cent, simple interest, on descending balances to be paid by the debtor, in addition to that interest there would be required a discount of 1.9 per cent if it is paid in twelve equal monthly installments. If it were paid in thirty-six equal monthly installments it would require a discount of 8.15 per cent. Now you ask, what does all that mean when translated into per annum return of moneys employed? The formula of the Federal Housing Administration works out to an annual return on moneys employed of 9.71 per cent per annum.

"At first thought you say that is too high. It is the lowest that has ever been offered for that type of thing. Generally there may be special exceptions. If you gentlemen will think in terms of 6 per cent per annum moneys for most of our purchasers that go to the bank and leave a 20 per cent free balance, I think you will find it converts into about 7.85 per cent per annum, and that is generally 60 or 90 day money. We are talking here about one, two or five year money.

"Now please don't misunderstand me on this. It can be badly applied if you just launch into it carelessly. It needs to be studied and built up with a lot of careful thought. If you are going to do nothing but divert otherwise cash buyers into time buyers, it is harmful; you would not be getting anywhere, and nobody wants to accomplish that. Unless you are going to have a net increase in the total volume of your business, it is not worth the doing. Every industry in which we have expanded time payment selling today has enjoyed a net increase in the total volume of business and we are now in our company and other companies handling installment financing for 80-odd industries."

QUESTIONS AND ANSWERS ON INDUSTRIAL LOANS UNDER FHA

1. *What do the revised FHA regulations mean to industry?*
The modernization credit plan has been broadened to include equipment and machinery as well as buildings.

2. *Who may apply?*
Any property owner, individual, partnership, or corporation, with a regular income from salary, commissions, business or other assured source.

3. *How much may I apply for?*
Loans up to $50,000 for improvements on any one property.

4. *To whom do I apply?*
Apply to any Worthington district office, Worthington distributor or your own banker for necessary application blank.

5. *If I obtain such loan, will I be under obligation to the Government, and expose myself to increased regulation?*
No. All loans will be made by banks and other approved regular sources of commercial credit. FHA acts merely as a limited guarantor.

6. *Can I obtain more than one loan?*
Yes. Each individual property is entitled to a loan of $50,000, if other conditions are satisfied.

7. *What conditions must be met to obtain these loans?*
The lending institution must be satisfied that you are a reasonable credit risk and in a position to amortize the loan.

8. *How and when must loans be amortized?*
In equal monthly payments extending over three years for loans up to $2,000 and extending over five years for loans up to $50,000.

9. *How much does it cost?*
Anything agreed upon by lender and borrower, except that the total interest and other charges must not exceed a $5.00 discount per $100 face amount per year.

10. *When can FHA loans be obtained?*
Anytime before April 1, 1936.

11. *Can loans be used for all types of equipment?*
Yes; except for such portable items as portable compressors and rock drills.

12. *Where do I make payments?*
The regular installment payments will be made in person at the place of business of the financial institution; or by mail; or as otherwise arranged.

13. *May I pay the note in full before maturity date?*
Yes. A reasonable rebate will be allowed for prepayment, if charges have been included in amount of loan.

14. *May I make more than one payment at a time?*
Yes.

15. *What if I am late in making my payments?*
You must not permit payments to fall in arrears. Persistent delinquencies will make it necessary to take steps to effect collection in full.

Balls Start Connecticut Brass Industry

Historical research connected with the Tercentenary Industrial Exposition, held recently at Hartford, shows that among the earliest brass products manufactured in Connecticut were brass balls for tipping the horns of oxen. These were made by Phillip Corbin of New Britain, whose equipment consisted of a grindstone, an emery wheel and two lathes operated by a horse tread-mill with two small casting furnaces.

TEMPORARY DIES

BECOME PERMANENT BUSINESS

Starting with low cost tools for an experimental job Dayton Rogers developed a die jobbing service for metal-working plants

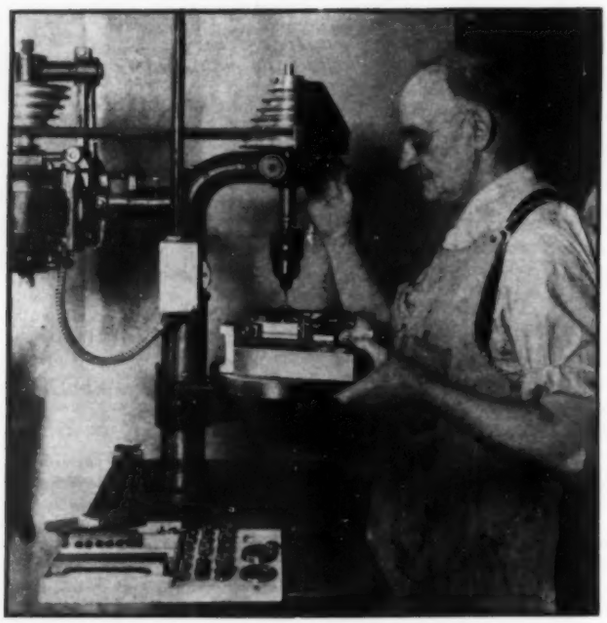


Fig. 1—As its name implies the "Holocator" cuts the time of locating holes

GIVEN an idea and perseverance plus some knowledge of machining methods, and something in the way of plant development is bound to happen. The outcome may not be at all that was at first expected, but that is the way many interesting industries have been built up. About fifteen years ago Dayton A. Rogers, then on the faculty of the University of Minnesota, had an idea for a domestic toaster of the automatic variety. As this was a sheet metal job and regular purchased dies would cost more money than was available for that purpose, Mr. Rogers employed a method of making temporary dies that has been used to some extent during the last half century. By this means parts for 500 toasters were produced at a low cost.

Methods of making temporary punches and dies have been illustrated at various times in this publication. One application described tools for making airplane fittings (*AM*—Vol. 51, page 221); another was published in 1934 (*AM*—Vol. 78, page 380), and a recent article by K. W. Peterson (*AM*—Vol. 79, page 723) shows how a few of these punchings may be made at a minimum cost.

With the experience gained in producing this toaster, and impressed with the low cost of such punches and dies for a limited number of parts. Mr. Rogers made a careful survey as to the possibility of commercializing a service of producing metal stampings in small lots, largely for experimental work until there was a sufficient demand to warrant permanent dies. This survey indicated that there was a field for such a service, if the dies could be produced cheaply. The correctness of these conclusions is indicated by the success of the idea which, beginning with a two-man shop, has now grown to an organization of 48 people, serving customers in all parts of the country.

This growth has been made possible by careful attention to details that affect the cost as well as the accuracy of these temporary small lot punches and dies. There is no hard and fast method employed, this being altered to suit conditions, as it makes a great difference in the tools whether the metal to be punched is 0.010 or 0.25 in. thick. The number of pieces required also affect the kind of punches and dies to be used. To date $\frac{3}{8}$ in. steel of various grades has been blanked in these dies with consider-

Fig. 2—A bench conveniently placed and tools within easy reach speed the toolmaker's task

Fig. 3 Left—Sensitive drills near the benches save footsteps, step-up output. Fig. 4 Right—Dies are checked and job stampings are made in a small but up-to-date press room

able success, and in sizes up to 24x24 in. taking about 250 tons pressure at the blanking press. Some of the "temporary" dies are now made to have a life of 5,000 pieces.

The factory is housed in a modern building and there are an even dozen trained toolmakers. Each toolmaker has a complete set of tools, partly paid for by the company, which exercises a control over the selection of the tools, so as to maintain a high standard. Each toolmaker is supplied with a combination angle plate and "holocator" built by the company. These are convenient in any tool shop, as can be seen in Fig. 1. The device locates drill bushings at any desired point on the work and aids in securing accuracy in die making.

In Fig. 2 is one of the toolmaker's benches, and his equipment. He gets excellent light from the window at the end of the bench. Some of his equipment is shown on the surface plate, while his tool box and reference books are easily accessible when needed. Large modern windows provide light by day and an easily adjusted lamp serves when daylight fails.

A view of the toolroom (Fig. 3) shows its general arrangement, with sensitive drills in the aisle, convenient to all the group. This also shows the illumination by ceiling lamps and reflectors. Press equipment, for making a great variety of stampings, mostly in small lots, is seen in Fig. 4. The metal stools or chairs have adjustable back rests which add to the comfort of the operators.

Whether dies be permanent or temporary, proper heat treating is most important. Some idea of the way in which this is handled in the Dayton Rogers plant, is seen in Fig. 5. This department is equipped for carbonizing, and for hardening and tempering both carbon and high speed steels. Gas welding equipment also forms part of the facilities of this department.

Fig. 5—Compact and complete, the hardening rooms show careful attention to layout

SERVEL BAFFLES AUTOMATICALLY

Recently were recounted some of the kinks used in finishing parts for the Electrolux refrigerator. Here is another on the same product which puts an old machine to a new use

FRED H. COLVIN
Editor

SOMETIMES a special job comes up that takes some ingenuity to lick. Usually it is desirable to make use of material and equipment on hand. An excellent example is the method adopted for inserting baffles in a tube at definite successive depths.

This job is now being done at the plant of Servel, Inc., where the Electrolux refrigerator is made. The baffles are drawn cups of sheet metal. Six of them are forced into the tube. For the forcing motion the ram of an ancient shaper is utilized.

Instead of a tool head, the chuck for the tube is bolted to the shaper ram as shown in Fig. 1. This simple chuck consists of a block bored with a half circle in which the tube rests. Above it is a clamp, also shaped to fit the tube and hinged ahead of center so that it grips the tube easily. An end guard is slipped over the tube.

The mandrels for inserting the baffles are of different lengths. Each mandrel is fitted with balls spaced around the end to hold a baffle. This feature can be seen particularly on the short mandrel at the bottom of the fixture. With all of the mandrels loaded, the operator turns the fixture until the long mandrel is at the bottom and then starts the shaper ram.

At the return stroke of the ram the fixture is turned automatically one notch and presents the next longest mandrel to the tube. Another stroke of the ram forces the second baffle into the tube, leaving it in proper location. The mandrel withdraws without disturbing the baffle in the least. The last mandrel, the short one, leaves its baffle at the point nearest the end of the tube, and the operation is completed.

The work is quite rapid and the re-

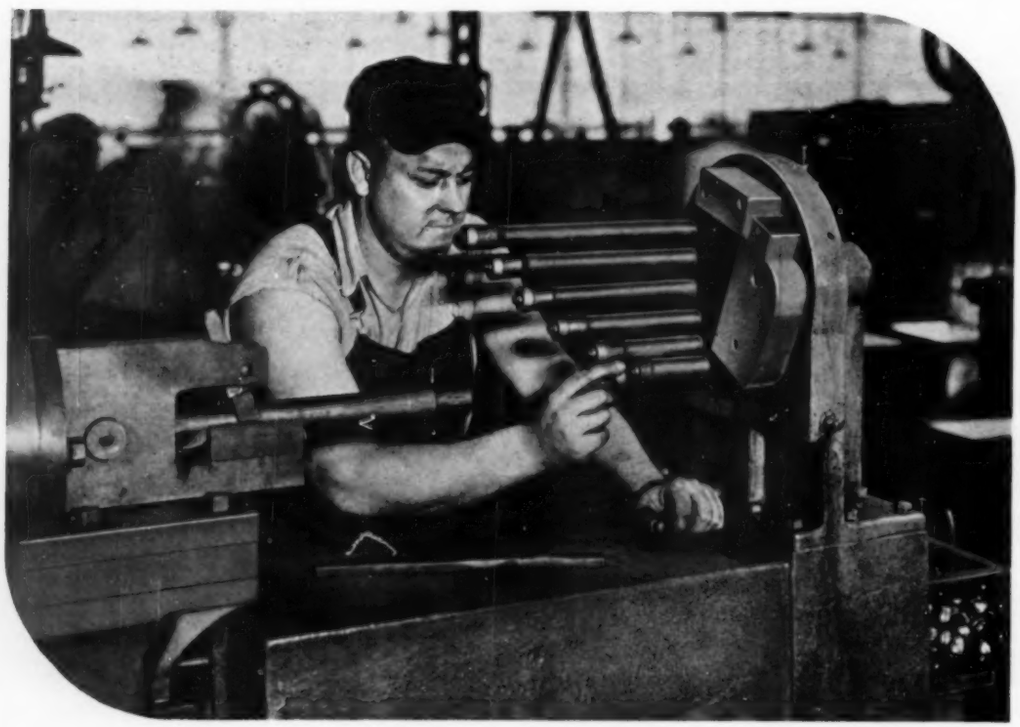


Fig. 1—An ancient shaper and an indexing fixture took the baffle out of the job of putting baffles into tubes

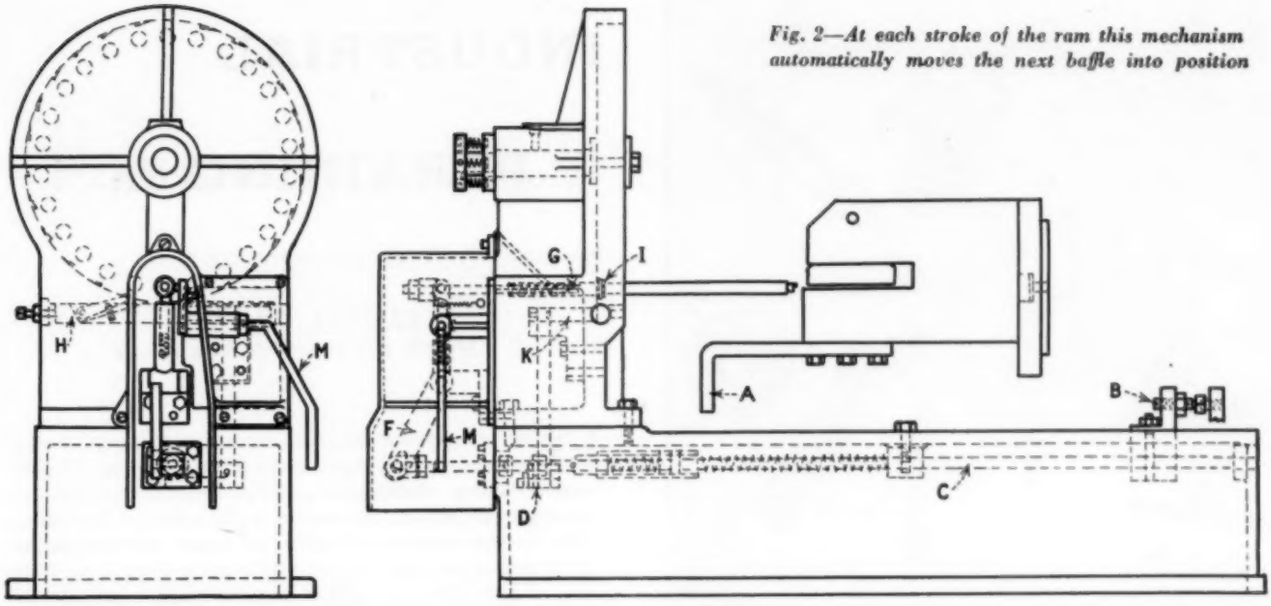


Fig. 2—At each stroke of the ram this mechanism automatically moves the next baffle into position

sults have proved highly satisfactory. Note the weights on the plate of the fixture which balance it so that indexing in any position may be accomplished easily.

Details of the indexing head are seen in Fig. 2, which shows the automatic features of the device. The L-shaped projection *A* on the shaper ram contacts the stop *B* on the return stroke and pulls back the spring-controlled rod *C*. This rod, through suitable levers and cranks, *D* and *F*, first withdraws the index pin *G* and then moves the rod *H* which carries a pawl that engages ratchet teeth on the edge of the disk and turns it one space.

As the shaper ram starts forward on its work stroke, the index pin *G* enters the bushing *I* directly behind the mandrel, and locks the disk during the operation. The arm that actuates the indexing pawl is seen at *K*.

Provision is also made for withdrawing the indexing pin by hand should this be desirable. This is done by the small lever *M* which is independent of the automatic mechanism.

Snug Reamer Blades

HECTOR J. CHAMBERLAND

The customary procedure of making line reamers in one's shop has always caused more or less inconvenience with a bad effect on accuracy and economy.

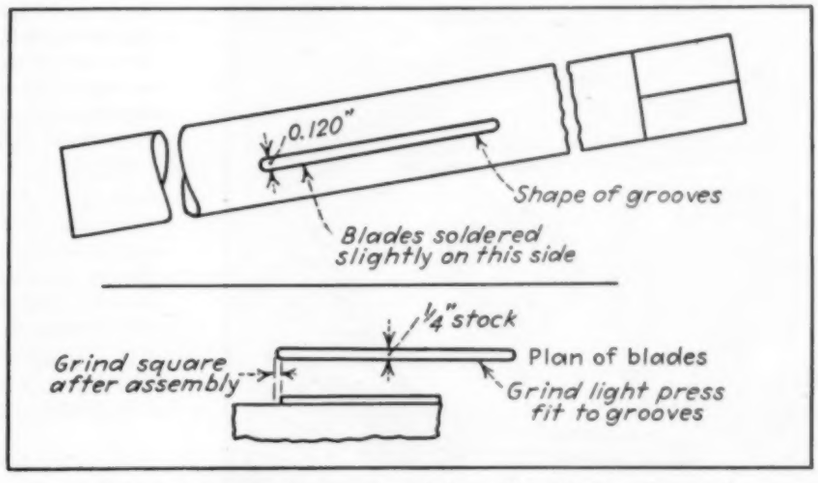
Because of blades being driven too snugly, both body and blades are jammed up each time the tools need resetting. The blades soon become loose, and regardless of resort to prick-punching as a detrimental help, they have a tendency to slide back with costly results.

I find that the method of making line reamers, as herewith illustrated, is the best and most economical. The reamers are made with four, six and eight blades, depending on the diameter. On a double reamer, it is advisable not to have both sets in line. Grooves are started with a slotting cutter ground to 0.120 in. thick and are finished to length with an end mill of the same diameter; a practical depth of groove is ¼ in.

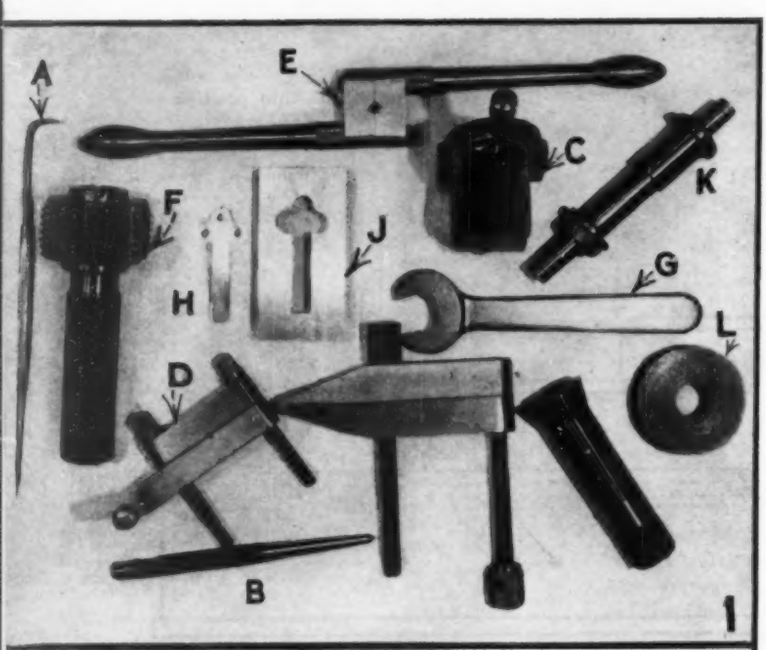
Blades are made from ¼-in. stock and are finished $\frac{11}{32}$ in. wide, thus allowing $\frac{3}{32}$ in. clearance between cutting edge and body. They are surfaced ground to a light press fit to the grooves and also ground to exact length; the latter operation is quickly done off hand.

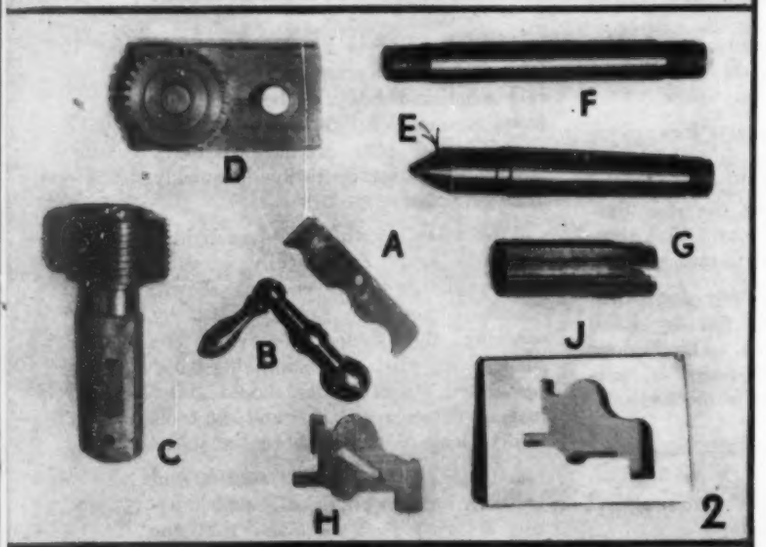
After assembly, the blades are lightly soldered and cylindrically ground square at the front end, as shown. These reamers are quickly reset by scraping the solder, removing the blades with pliers and shimming 0.005 in. Each set of blades should stand at least fifteen resettings, and the tools always look as any such tool should.

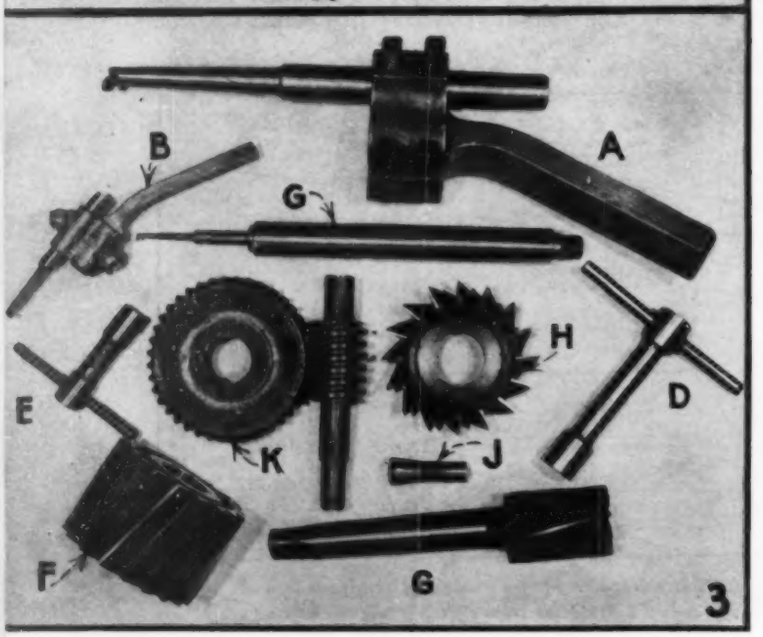
After resetting any line reamer and before grinding cylindrically and clearing, it must be ascertained that the body is radially true within 0.001 in.



Soldered in place, line reamer blades will hold their place and may readily be reset at least fifteen times







INDUSTRIAL TRAINING in

SAMUEL GAHAN
Murray Hill Industrial High School

DURING my summer vacations for the past twenty years, I have visited many of the leading machine manufacturing establishments, power plants, and other engineering projects in this country, Canada and the British Isles for the purpose of keeping in touch with engineering development and also to ascertain what is being done in the way of industrial training of boys through apprenticeship systems, employers' schools and public schools. On all occasions I have been royally received and given every opportunity to acquire the knowledge I desired.

I regret, however, to say that many men in responsible positions in the engineering field consider our work in the public schools as something of a joke. They humorously ask me if we still make, as exercises, barn door hinges, brass candlesticks or toy anvils. Of course I try to assure them that we are doing better now, which on the whole, I believe to be true, but in my heart I fear that many schools are still running along the old lines. In fact I know that the brass candlestick was for years a pet project in a teachers' training college, but it is only fair to say that the student made the wood pattern, the mold and the casting as well as doing the machine shop work. As for the toy anvil, it usually figures in elementary school work, though I know of a technical institute that gave on the whole a good evening course in machine shop work requiring their students to spend the first three months in chipping and filing projects of the toy anvil variety—work that required no accurate measurement.

Anyway when I see the revolutionary changes in manufacturing methods, the inventive ability displayed, the modern buildings and the general immense advance in the engineering field, and compare that with the meagre progress made in public school systems of industrial education, I do not blame the men responsible for this mighty work for looking upon school men as nincompoops, and feel that our educational authorities need to be vigorously awakened.

This article is written to show what is being done in one industrial high school even in a very short course and under rather unfavorable conditions—a wretched, unsuitable building, artificial and inadequate lighting, middle-aged machinery and lack of suitable materials and supplies—and to indicate what might be accomplished under a more favorable system.

Our school offers to elementary school graduates a two-year course in any one of about a dozen trades. The course is divided into four terms of about twenty weeks each. The

Figs. 1, 2 and 3—Regular assignments for the four terms call for micrometer measurements and a wide range of machine tool operations

PUBLIC SCHOOLS

The aid given industry by shop courses in public schools points toward the need for more modern facilities

pupils spend three hours a day in the shops, or about 300 hours per term, and three hours a day in academic and related studies: mathematics, science, mechanical drawing, freehand drawing, English, civics, health education and other subjects.

In the machine shop, we endeavor to follow modern shop practice as closely as is possible. The projects and the order in which they are given are designed to encourage the pupil to use his brain as well as his hands. As the machine tool equipment is limited and fixed, the amount of bench work given varies with the size of the classes. We try hard to keep the machines running every minute of the time. The projects given may be divided into three groups or classes:

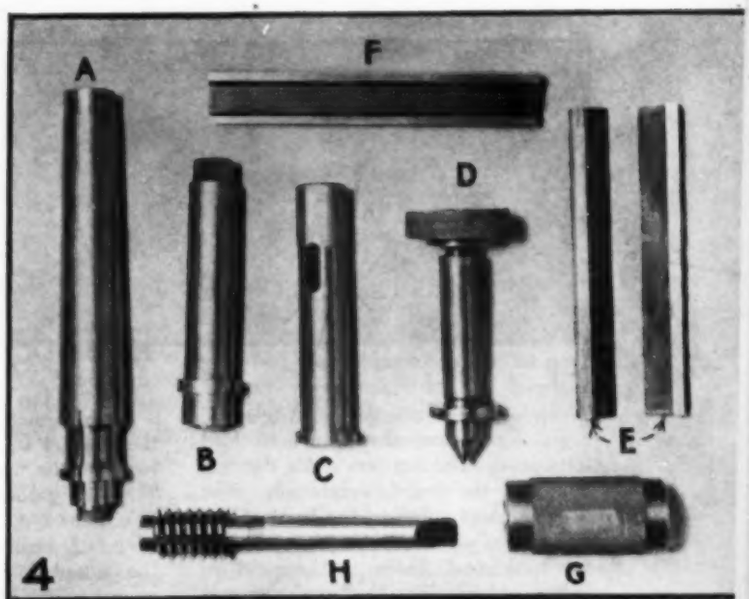
Group I—Regular projects to be made by average pupils. A few of these are shown in Figs. 1, 2, 3.

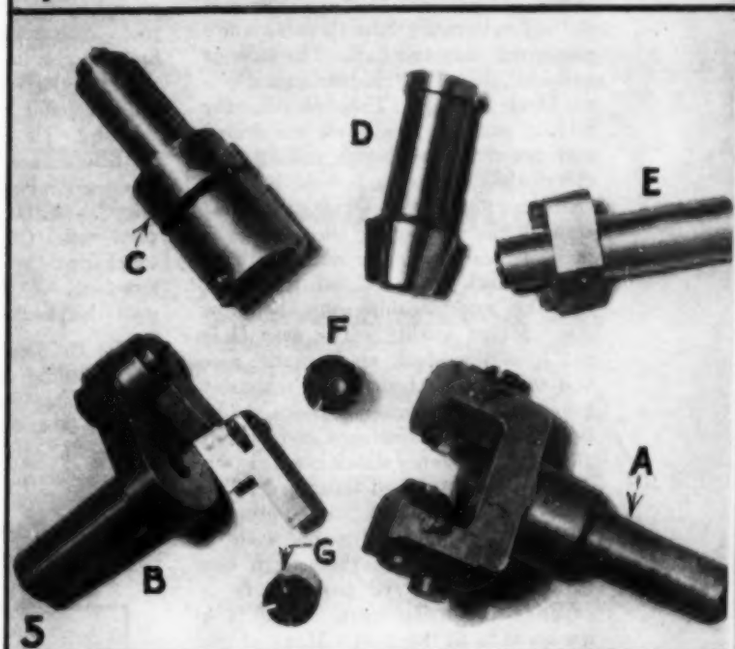
Group II—Repair and maintenance work, and new tools and appliances to be used in the shop, mainly to facilitate the work on regular projects. Figs. 4, 5, 6.

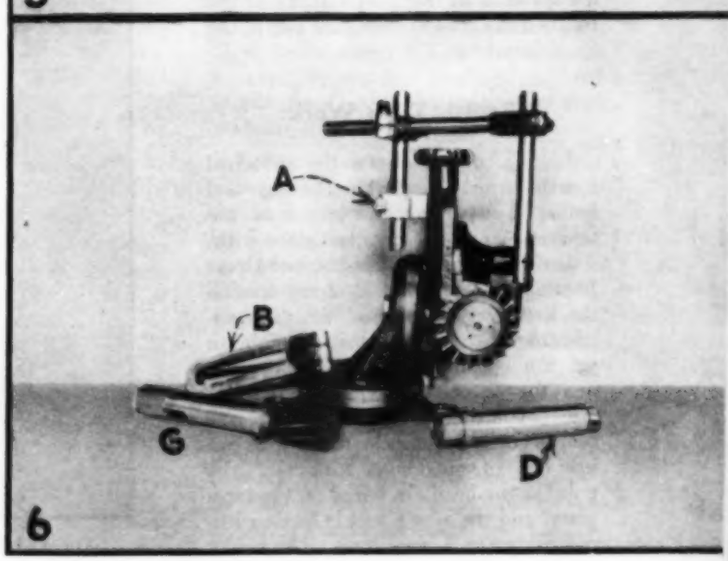
Group III—Advanced projects for exceptional boys. Work for demonstration and exhibition purposes. Tryout work for determining future regular exercises. Figs. 7, 8, 9. 10.

In Fig. 1 is shown some of our first year work. The scriber *A*, the center punch *B*, the V-block and clamp *C*, the dog *D* and the tap wrench *E* are first term jobs. In this term the boys learn to use the micrometer. Their jobs must appear workmanlike or they will not be promoted to the next term. The chuck cleaning tap *F* involves many new exercises: boring, reaming in the lathe, thread chasing, milling on centers, keyseating, and backing-off threads. The handle must be a good fit in the head. The wrench *G* is made because it furnishes good bench work exercises. It is the first job of laying-out that involves the use of the bevel protractor. The laying-out is done from a printed instruction sheet and must be perfect. A very thin wrench ($\frac{1}{16}$ in.) is first made for practice, and if it passes inspection, the full size one is started.

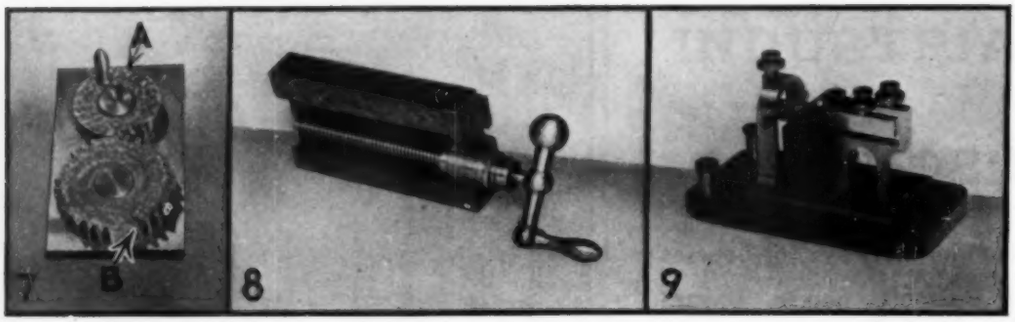
For further bench work the key blank *H* is given, and if it is satisfactorily made, the die *J* follows. This job, perhaps, should not be called a die as it is made of cold-rolled steel. However, it gives practice in die-making methods and in the use of the filing machine. The shaft *K* is a copy of the shaft used for the table feed of a Pratt & Whitney bench milling machine. On this piece are four diameters which must be made to micrometer measurements, one of







Figs. 4, 5 and 6—With design and layout left largely to the initiative of the boy, toolmaking is taken up by the more apt pupils



Figs. 7, 8 and 9—Advanced projects are available to exceptional boys and those who return for post-graduate work

which must fit the gear blank at *L*.

In Fig. 2 are shown a few third term jobs. The templet *A* for the ball handle is the first faceplate job. The holes corresponding to the balls of the handle are accurately bored in a wider piece of steel which is then cut in halves. One-half is filed as shown and the other is made into three separate gages, one for each ball. The ball, or balanced, handle *B* is the second job of hand turning. The holes in the middle, and the small ball are drilled and bored in the bench milling machine while the work is held between centers. The holes do not go entirely through the balls. The thread gage *C* involves practically the same exercises as the chuck cleaner shown in Fig. 1, but the workmanship must be of a much higher quality. The gear *D* is cut from the blank made in the second term. It is tested with a master gear on the fixture as shown. The lathe center *E* is hardened and ground all over. The taper shank is fitted to a Morse No. 3 standard taper gage. The mandrel *F* is also hardened and ground. The shell reamer is made with a straight hole which is lapped to size before the teeth are ground. *H* is called a typewriter part, and *J* is a die made to fit this part. Many of the fourth term jobs are roughed out in the third term.

Fourth Term Work

In Fig. 3 are shown the principal fourth term jobs. The boring tool holder *A* is a copy of one put on the market many years ago but since withdrawn by James Pullan, then of Great Barrington, Mass. It is in my opinion the best ever offered for sale. The adjustable feature makes it possible to set the boring tool or bar horizontal and to the correct height on various sizes of lathes. Then if the boring tool is correctly made as shown we can use one of maximum stiffness. The holes in the head are bored on the faceplate, and the whole tool is made without using any special tools. The holder *B* is for bench lathe use. By using the adapter *C*, the bench lathe boring tools can be used in the larger holder. The spring chuck used in the adapter *C* is shown at *J*. The square socket wrench *D* is made for the holder *A* and the adapter *C*. The small socket wrench *E* is used with the bench lathe tool. The helical mill *F* furnishes the first exercise in helical milling. In setting up the milling machine for this job, the pupil is required to do his own thinking. He is given no assistance by his teacher but is encouraged to study Burghardt's book, "Machine Tool Operation, Vol. II." This method works very well. Of course, it is necessary to change the required angle, or the direction, of the spiral as each boy starts his work.

The end mill *G* is the next job of spiral milling work. We usually make these mills with a No. 7 Brown & Sharpe taper shank. *H* is an angular cutter. In setting-up the dividing head to the correct angle for milling the teeth the pupil is required to find each angle from the tables contained in *American Machinist's Handbook*. In all jobs of cutter grinding, including the end teeth of end mills, the pupil is required to set-up the cutter grinder from instructions contained in the book, "Tool and Cutter Grinding," published by the Norton Company. Our cutter grinder, by the way, is not a Norton so that makes it a little more difficult and interesting for the boy.

Group 2 Projects

In Fig. 4, *A* is an expanding mandrel or arbor for the dividing head of milling machine. It is used for holding side mills and angular cutters while milling the teeth. *B* is an expanding mandrel used on the cutter grinder for holding cutters as shown in Fig. 6. Of course we require many sizes of those expanding mandrels. *C* is a holder for taper shank end mills used when grinding the end teeth. *D* is a center used in the overarm of a milling machine. It is hardened and ground all over. *E* shows a pair of hardened and ground hold-downs for planer and shaper use. *F* is one of a pair of hardened, ground

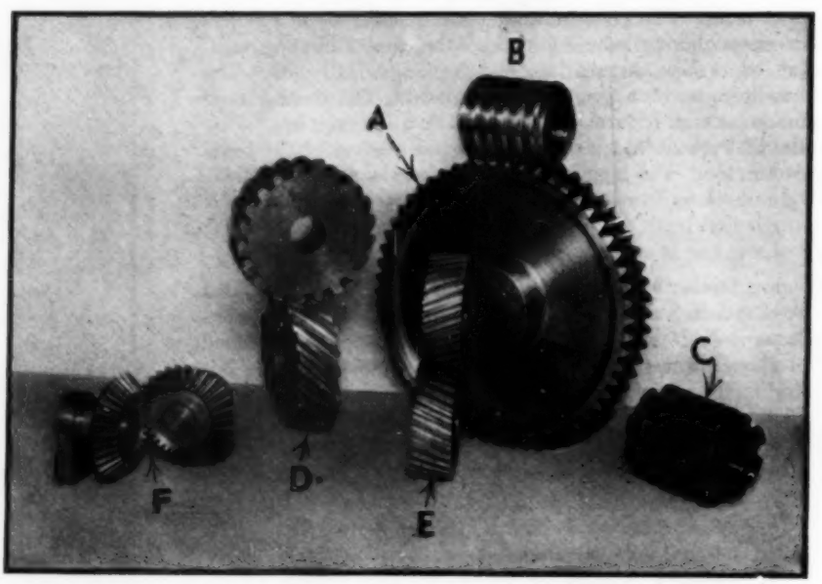


Fig. 10—Miter, helical, worm gears and hobs tax the students' ingenuity

Fig. 11—One of the pupils finishes a milled tooth bevel gear by means of a filing machine

and lapped parallels, 1 in. high, used with a height gage for laying-out work. *G* is a Brown & Sharpe No. 7 taper gage. *H* is the hob used for hobbing the worm gear shown in Fig. 3.

In Fig. 5 are shown a few screw machine tools. *A* is a diamond knurling tool; *B* is a swing knurling tool; *C* is a releasing die holder; *D* is a spring chuck; *E* is an adjustable or floating reamer holder; *F* and *G* are hollow mills.

In Fig. 6 is shown the universal head or fixture of a cutter grinder. The attachment *A*, clamps, tooth rests, etc., were designed and made by a boy from illustrations in the Norton book previously referred to. This attachment converted a practically useless tool into a very convenient one. *B* is a tooth rest holder. The end mill holder *C* and the expanding mandrel *D* are similar to those shown in Fig. 4.

Work for Exceptional Boys

In this group or class there is practically no limit to the variety of practical work that may be found in the machine shop, but as most of the jobs have to be designed by the pupils themselves, or at least made from rough sketches, only the exceptional boys in a short course like ours have had time to develop the initiative necessary for this work. Should a project in this group appear to be a good regular exercise, then blueprints and instruction sheets are prepared and the project placed in group I.

In Fig. 7 is shown a model of intermittent gearing. Each complete turn of gear *A* moves gear *B* one sixth of a turn and also locks it in this position until the teeth of gear *A* again engage with the teeth of gear *B*. The workmanship must be quite accurate, because if the pitch diameter of *A* should be even slightly undersize, gear *B* would not be held in position but could rock from side to side.

In Fig. 8 is shown an "abbreviated" milling machine table with square thread feed screw and graduated collar. It is similar in every respect to the table of the Pratt & Whitney bench milling machine except that it is much shorter. The dovetail slide is scraped to fit its mate and the top of table is ground.

In Fig. 9 is a telegraph key or sender. Such projects furnish exercises in bench lathe work, brass working, silver soldering, assembling, coil winding and lacquering. The mahogany bases were polished in the woodworking shop.

In Fig. 10, *A* is a worm gear about 8 in. in diameter. The worm *B* is about 2½ in. in diameter with 2½ t.p.i. The hub *C* was used to cut the worm gear. The worm gear, worm, and hob were made by the same (fourth term) boy. Helical gears *D* and *E*, and miter gears *F* and the testing fixture upon which the miter gears are mounted were made by a boy who returned for a post graduate or fifth term.

As we all know, a bevel gear cannot be correctly cut on a milling machine. We, therefore, follow the usual method of making the teeth as nearly correct as possible at the large end to the correct width on the pitch line at the small end, and then finish by filing. Now we can hardly expect a boy of 16 or 17 to do an expert job of gear filing by hand the first time, so I suggested that he rig up the filing machine. I explained the principle and made a rough sketch or two, and before I knew it, the job was done and well done too as could easily be checked with the testing fixture. Fig. 11 shows the boy at work.

Keep the "Keep Clean" Signs Clean

JOHN R. GODFREY

"Some managers," said Old Man Johnson the other day, "think all they have to do is to make a lot of rules, or put up a raft of signs, and the dog-gone business will run itself. Greatest mistake in the world. If I was going to make a slogan—or whatever it is—I'd say, 'the more signs, the less management,' and the same thing goes for rules. Listen to what I bumped into the other day, and weep.

"Bill Crissy—the man who makes those nice molded plastics that look like they were carved—has been having trouble with his material. Didn't get the results he knew were possible, so he kicked to the salesman from his source of supply.

" 'What's the trouble, Bill?' says the salesman.

" 'Looks like plain dirt to me,' says Bill. 'I've never been in your plant, but I'm betting you don't keep it clean.'

" 'Guess again, Bill. That's one thing we pride ourselves on. We preach cleanliness all through the shop.'

" 'Preaching is one thing,' says Bill, 'and producing is another. How much do you really try to keep things clean?'

" 'If I didn't know you so well, Bill, I'd be peeved. We not only preach cleanliness, we keep it before the plant people all the time. We build dirt-proof houses around our presses, and go to extremes. Come down tomorrow and let me show you.'

"So next day Bill asked me to go along with him. The salesman was right about signs and the dirt-proof houses. Signs everywhere. 'Cleanliness First'—'Dirt Is an Enemy'—and other equally snappy warnings against dirt.

" 'You see, Bill,' the salesman said, 'how we impress the idea of cleanliness on every employee. Can't be any dirt trouble here, as you can see. Any suggestions, Bill?'

" 'Plenty,' says Bill, and he was real peeved. 'Your signs preach cleanliness but you don't practice it. Your whole shop is dirty. The doors on your dirt-proof houses are all wide open. If I was running this joint I'd begin by cleaning the "Cleanliness First" signs. I can write my name on any of them.'

"All of which," remarked Johnson after a pause, "shows that management means a lot more than plastering 'Keep Clean' or 'Safety First' signs all over the place. Management means to see that orders are carried out. The fewer signs and rules the better."

FLANDERS' ADDRESS SETS A.S.M.E. KEYNOTE

Replete with social and technical activities, annual meeting affords gala week for members and guests

BETWEEN luncheons at noon, dinners at night, technical sessions mornings and afternoons, committee meetings, industrial excursions, awards of honors, the president's reception and annual dance, members of the American Society of Mechanical Engineers are enjoying a full week. As retiring president of the A.S.M.E., Ralph E. Flanders, president, Jones & Lamson Machine Company, delivered an address on "New Pioneers and New Frontiers," at the annual dinner.

Another dinner speaker was E. E. Free, vice-president of the League for Less Noise whose subject, naturally enough, was what causes racket and how to eliminate it. Dean Robert L. Sackett, School of Engineering, Pennsylvania State College, was toastmaster.

The preceding night was Honors night. Dr. William F. Durand, professor emeritus of Leland Stanford University and past president of the A.S.M.E., was presented with the John Fritz Medal for 1936 in recognition of his achievements in hydrodynamic and aerodynamic science. The A.S.M.E. medal went to Charles T. Main, consulting engineer, another past president. Other awards were the Melville Medal to O. R. Wikander, the Worcester Reed Warner Medal to Prof. Stephen Timoshenko, and the Junior Award to S. J. Mikina.

The seventh Henry Thurston lecture followed the conferring of the awards. This year's lecturer, Charles H. Purcell, chief engineer of the San Francisco-Oakland Bay Bridge, told how that structure, the largest of its kind in the world, was erected.

"Sometime in the period since the turn of the century—not on any given day or in any given year—the physical frontier, in the grand sense, disappeared and disappeared forever," said Mr. Flanders during his address.

Retiring President

Harris & Ewing

RALPH E. FLANDERS
Jones & Lamson Machine Company

"This was the greatest event of our times. If we are looking for some effective cause for the evils which have been afflicting us, why look further? We build up our false or inadequate theories of 'overproduction' when we have never had a decent general standard of living in this country; of 'technological unemployment' when on technology alone can be found our hopes for the higher standards of the future, of 'over-investment' when an adequate provision of goods and services to the mass of our fellow citizens requires larger and more efficient productive facilities than we have ever dreamed of. All of these explanations and many more are shallow and inadequate.

"What shall we do in the face of an emergency so fundamental?

"Two courses are open to us. We can readjust our social, political and industrial institutions to a future of limited opportunities for men and for money, with a national outlook keyed down to safety as our objective, instead of the old purposeful advance toward a better future. The alternative is that we find an equivalent for the lost frontier—an equivalent which will as effectively open new opportunities for men and for capital, and make it possible for us to retain our constructive national psychology.

"For the time being, we seem to be making the first and poorer choice. In some directions deliberately and in others by indirection we are slowing down our production of goods and services. In place of a confident advance toward business risk and personal adventure, we are all playing safe—business men, worker and farmer. We are at this moment organizing a new world of restricted production, restricted human enjoyment and restricted opportunity for the coming generation. We have chosen to play the lesser part.

"We need not do this and we must not do it. For the effective equivalent of the old physical frontier lies ready at our hands for our occupation, development and enjoyment. That frontier lies so close at hand that it es-

capes our notice. Its separate features are so familiar to us that we have missed its significance as a whole. For the new frontier is not a distant physical region, it is an everpresent social possibility. This new social frontier is a greatly raised standard of living for the mass of our fellow-citizens.

"At first sight this proposal for a new frontier may seem trite and inadequate. But let us examine it before passing hasty judgment. Let us consider first and principally its material characteristics. Of what are they composed?

"A higher material standard of living does not mean higher wages, higher salaries or higher dividends. It does not mean higher prices for goods or services—least of all does it mean restriction of output. It does mean more and more goods and services at lower and lower prices relative to incomes.

"Our progress toward a higher standard will thus definitely provide the opportunities for men and for money that were furnished by the old frontier, and as this fact becomes obvious, it is plain that our old psychology of firmly based optimism will revive, and our newly injected defeatism will wither and disappear—a consummation devoutly to be wished for.

"If this new social frontier is physically attainable, and offers a continuation of the services which were rendered to us for so many generations by the old frontier, we must be in earnest in our determination to discover and surmount the obstacles which deter us from entering into it.

Many Causes of Trouble

"We have made good progress towards an ever rising standard of living in the past, but in recent years our forward movement has been checked, and we have even been forced backward from our goal. The causes of our trouble have not been single, but many. But, of the many, two are of such overshadowing importance that it is folly to disturb ourselves about the minor difficulties until we have found means of surmounting these major ones. In fact, we cannot even see the other problems clearly until these two have been solved. Thus attacked, the whole problem will more readily yield to solution.

"The first obstacle is a false idea, and it is the more dangerous from being held by a great majority of the population of the country. Business, labor and agriculture account for almost the whole body of persons engaged in providing a high standard of living and all three of these groups are imbued with this false idea, and strive to make it effective. That false idea is that the best interests of each separate group are best served by control or restriction of output and by maintenance or raising of prices.

"Industry has long been fascinated by the possibility of understandings between competitors which lead directly or indirectly to price and production control. So evidently profitable does this appear that the movement toward agreement and combination has been almost irresistable. As early as 1890 Congress recognized the rapid growth of the movement and passed the Sherman anti-trust act forbiding 'conspiracies in restraint of trade.' But in spite of that legislation and of the succeeding Clayton Act and the establishment of the Federal Trade Commission, business has openly or secretly, consciously or unconsciously, moved in that direction. Some industries have, indeed, been so 'successful' in coming to agreements that they have encouraged outside competition and quite evidently defeated their purposes.

President Elect

Blank Stoller, Inc.

W. L. BATT
S.K.F. Industries, Inc.

"Labor union policy has been identical with business policy. But since the commodity dealt in is labor and skill, the fallacy is expressed in somewhat different terms. Labor union policy seeks 'shorter hours and higher wages' without any expressed or discernible limit. And some unions, like some businesses, have been so 'successful' in this policy that their members are idle for months and years when other workers are profitably employed.

A False "Success"

"Agriculture has long looked with envy on the 'success' of business and labor in carrying out this false idea, and at long last it too has its chance, under the AAA, to limit production and raise prices; and it too is meeting with the 'success' of lost foreign markets, stimulated foreign competition, and actual importation of products which our farmers are well able to supply.

"When business, labor and agriculture hold the same beliefs, be they true or false, we must not be too surprised if the administration hastens to embody those beliefs in the law of the land. This was done and as a result we had AAA and NRA. But legislation cannot purge a fallacy of its folly.

"This first obstacle, then, is in the nature of a drag or brake or a heavy load to be carried. The second has more the nature of a recurring catastrophe which, when it occurs, not merely retards our advance but stops it completely. It not merely stops it, but throws us backward and destroys the very mechanism of progress, so that we must spend weary months and years in repairing it before we can regain our lost ground and resume our advance.

"This second obstacle is the periodic onslaught of speculative frenzy to which our social organization is subjected.

"We should clearly understand what we mean by 'speculative.' In the sense in which we are using the word it has no connection with business enterprise or business risk. A man may risk his time and all the funds at his command in the development of a new machine or a new product, or simply in an attractive business opportunity of the conventional sort. The outcome may be doubtful and may be called 'speculative.' But the proceeding is essentially healthy if pursued with judgment and in the light of experience. On the willingness of the business community to engage in such risks are based our hopes for expanding em-

ployment and a rising living standard. Speculation is quite another thing and is most unhealthy when carried out on a large scale. It will best be understood if we describe the conditions under which it flourishes.

"Periodically business men become discouraged with the slow and meagre profits of normal business, which is the business of producing and distributing goods and services. Normal business profits are small. If on the one hand we admire the returns from certain well managed or especially fortunate organizations, on the other we observe the thousands of businesses which struggle along for years without profit, finally sinking into bankruptcy with losses which run to hundreds of millions in the aggregate. Between the two extremes lies the general average of business success which, with infinite work and worry, returns to its owners little more than the normal interest on the capital invested.

Using Future Profits

"From time to time the business world, discouraged with this meagre return, looks about and discovers lying ready at hand a marvelous mechanism which promises to work to a most attractive end. Instead of finding in his hands at the end of the year only the small profits of this year's business, this mechanism promises that the business man can hold in his hands to use or spend and enjoy *now*, not only the profits of this year but next year's profits as well—the profits of five years ahead—the imagined profits of future generations. This mechanism, ready at hand for such delectable use, is the speculative market for securities, real estate and commodities, with the financial mechanism to which it is geared. The endeavor to realize far future profits by the use of this mechanism is 'speculation' in the sense in which we are using the term.

"When the professional speculators are joined by thousands of business men, and finally by the general public in the operation of this mechanism, it does seen to work. For many months or for a term of years we do find new, spendable wealth in our hands—new millions, new billions. Apparently we can reach far into the future, seize its profits and enjoy them now.

"But it is in appearance only. There is no mechanism which will reach into the future and seize the profits of years not yet born. The reality is ugly and sordid. If there are new billions of 'wealth,' those billions came directly from bank borrowing by purchasers of the securities, real estate or commodities, to finance their purchases above cash margins which were comparatively narrow. Bank credit money, from its very nature, is generated by the process of borrowing, and dissappears when the debt is paid. In consequence, for every billion of new wealth there is somewhere a billion of new indebtedness, and if that billion of indebtedness becomes due and must be paid, then somewhere a billion of 'wealth' must disappear.

"That volume of indebtedness—that source of fallacious wealth—is an incredibly flimsy and fantastic structure when we reach the end of a protracted speculative boom. It finally becomes evident to every one that the future profits on which present prices are based can never be realized. When that does become evident prices fall and debts become due. And then, for long months and years every cent of savings, every mite that can be spared from the bare expenses of existence, must be devoted to the liquidation of that indebtedness. These sums are lost to purchasing power, and these months are months of destruction and defeat. The damage must be painfully repaired before we can again resume our progress toward the new social frontier, the raised standard of living.

"These two obstacles, the false idea and the destructive calamity, are not light matters. We have struggled with them for generations, and they have grown stronger with the years. What hope is there that we will ever control or overcome them?

A Brighter Outlook

"I am glad to stand before you tonight and to say that to me the prospect for sanity and intelligence in these matters looks brighter than at any time in the past. We have done much thinking. Experience has brought to us bitter lessons. Some of them we have learned.

"We have, for instance, one example before our eyes of an industry which has never for a moment worshipped the false gods of production control and raised prices. The automotive industry has always been willing to submit to severe competition, and in consequence it has year by year built more and more and better and better cars and sold them for lower and lower prices. In further consequence it has made the greatest increase in employment and payroll dollars and is the most prosperous of any of our great industries. It has made the greatest contribution to industrial recovery. Other industries are taking notice and considering their ways.

"Furthermore, there is a growing realization that if industries agree on price and production instead of competing, they open the door to government regulation. Indeed under those conditions, government control becomes an inescapable duty. On the other hand, for an industry which submits to the hazards of competition, and governs its prices and output thereby, governmental control is an unwarranted impertinence and a social calamity. Viewed in this light, our anti-trust legislation is the strongest protection available to business. These things are becoming clear, and if there is any drift of business opinion it is away from the fallacious search for safety, and toward intelligent courage.

"Industry must lead the way. We cannot expect labor or agriculture to do so. The prosperity which will come to industry as a whole in so doing will so directly increase the demand for labor and for agricultural products that the artificial methods hitherto applied by these two groups will be clearly seen as the hopeless proceedings which in reality they are.

"As to the control of speculative frenzy, we can point to much more definite items of achievement. Beginning with the Glass-Steagall Act of the last months of President Hoover's administration, and ending with certain useful elements of the banking act passed last summer, we have provisions which by no means insure us against a recurrence of this calamity, but which do provide us with tools which, if wisely used, will greatly diminish the severity of any future attack.

"It must be clear to all that engineers have a particular interest and responsibility in these matters. We cannot sit idly by and see the choice made for us.

Engineering Courage Needed

"If, faced with the disappearance of the physical frontier, we cravenly resign ourselves to accepting that fact as final, and key our national policy and our national hopes down to that dismal decision, there will be little future for the engineer. There will be fewer of us, and our services will be of a subordinate order.

"If, on the contrary, we make the more courageous decision to replace the lost physical frontier with the new social frontier of the raised standard of living, then the engineer will come into his own.

"For the raised standard of living demands more goods and services, of better quality and at lower cost. This is the service which the engineer is qualified to render. To this was he born; for this was he educated; this is his life work. In a society dedicated to this end he will find profitable employment, satisfying recognition and useful, essential service of the general good. With the scientist, the inventor and the broadly-visioned business executive he will pioneer in the founding of a new order as far surpassing our present one as that does the barbarism of earlier ages.

"We are faced with these alternatives —to retreat or to advance. Is there any doubt as to which the American people should choose? Nay, rather, is there any doubt as to which they *will* choose?"

Technical Program Varied

The varied program of well over a hundred technical papers included many of interest to the metal-working industry. Particularly applicable to shop operations were "Desired Characters of Surface Finishes," by J. E. Kline, Hutto Machine Division, Carborundum Company; "Developments in Drop Forging and Their Relation to Current Machine Shop Practice," by R. E. W. Harrison, Chambersburg Engineering Company; "A Study of the Turning of Steel Employing a New Type of Three Component Dynamometer," by O. W. Boston and C. E. Kraus, University of Michigan and "The Torque and Thrust of Small Drills Operating in Various Metals," by O. W. Boston and W. W. Gilbert, University of Michigan.

Mr. Kline's paper gave many of his audience a new conception of fine surface finishes. The author started with fundamentals of molecular composition and pointed out some of the factors which contribute to friction.

Describing the important influence of lubrication in any consideration of surface finish, Mr. Kline stated, "In any event, the presence of a lubricant is extremely advantageous, as oil itself is a molecular structure interposed between the contacting surfaces and becomes a ball-bearing medium. Inasmuch as a ball will not roll across a groove as wide as its diameter and more than one-half its diameter in depth, it is apparent that roughly finished surfaces are not satisfactorily lubricated with lubricants of fine structure. With this conception in mind, finely finished surfaces can be considered not so much as bearing surfaces, but as 'races' on which the molecules of lubricant roll. It is generally conceded that properly fitted and lubricated working parts never touch each other while in operation, but are held in spaced relation by the lubricating film.

The effect of the method of finishing was given by the author as follows:

"Actual use of these mechanically perfect surfaces has revealed that the *type* of surface is not as important effectually as its *character*. Just as the character of man is molded by heritage and environment, so also is the character of a surface formed by the tools that shaped it, or gave it birth, and lastly by its contact with contiguous surfaces.

"It is acknowledged that the cutting of materials in any manner leaves a mark, or rather a multitude of marks, to record the disturbance of the molecular structure of the material. These marks follow the path of the cutting tool, whether the displacement of the material is accomplished by boring, reaming, broaching, grinding, honing, lapping, or kindred methods. Opticians tell us that the horny cells of the skin in the human finger will produce a scar of measurable depth when drawn across the surface of a highly polished lens. Microscopic examination of the most highly finished surfaces yet produced will disclose the direction of the movement used to obtain the finish. The directional marking we choose to call the *character* of the surface.

Visual Check Deceptive

"Simple proof of the mechanical and practical advantages of surface character may be obtained by comparing the coefficients of friction and wear of two surface-ground objects when moved longitudinally and transversely upon one another with respect to the markings made upon their surfaces by the grinding wheel. Furthermore, convincing evidence of the fallacy of 'visual calibration' of surface finishes may be had by comparing the appearance of a 'finely ground' surface viewed across and along the wheel markings. In the former instance, the surface appears to possess high reflective qualities, whereas in the latter it does not because of the wheel markings which are now visible.

"Actually, a number of manufacturers have already adopted corrective marking operations with remarkable improvement in product efficiency. Surface-finish calibrations arbitrarily established as the engineering ideal have become of less importance. Excellence of reflecting qualities is no longer a factor with these manufacturers. They now pay little attention to the appearance of surfaces, but rather concentrate their efforts on obtaining improved performance, which, in the final analysis, is the goal we all seek. Examples from actual practice will illustrate the old and the new conceptions of proper finish for running parts.

"In usual honing practice," Mr. Kline said later, "the peripheral speed of the hone is from four to six times the reciprocating speed. The correct relationship between these motions takes into account numerous factors, including grain or fiber structure of the material honed, its hardness, the diameter and length of the work bore, and characteristics of the abrasives used. The average operating speeds for honing are approximately 200 f.p.m. for rotation and 45 f.p.m. for reciprocation and are generally used to advantage on low-alloy cast iron in particular. In bores of average size this combination generates a steep-angled helix which crosses back upon itself many times and results in a surface of diamond-shaped grids quite unlike markings produced by any other means of finishing. Many manufacturers will not accept such a finish and insist on having one of high reflective ability.

Rotation and Reciprocation

"This high-lighted surface is easily obtained without necessarily changing to finer grit stones, by increasing the rotative speed of the stones while maintaining the reciprocating speed constant. Two effects then result: Increasing the rotative speed causes the stones to glaze slightly and hence literally to iron out the surface; secondly, the helix angle changes from a steep to a shallow one. The surface looks much smoother, partly because it is planished, rather than ground, and partly because the inevitable grit marks cannot be easily seen when the bore is viewed, necessarily, from the end. The tool marks are there, nevertheless, and are at almost 90 deg. to the direction of the ultimate run-in marks. An approach toward longitudinal tool marks is obtained with a steep-angled helix, and the planishing effect may still be obtained by means of slightly harder abrasives."

In concluding Mr. Kline pointed out that "in general, three factors must be correlated when the question of finish is under consideration: fit, run-in, and lubrication. For example, if the tolerances of the final finishing

operations on mating parts will not permit a satisfactory operating clearance, a planished surface on both parts should not be used. Not only is the period of running-in unduly prolonged, but the danger of seizure is imminent. The reason the old-type hand-scraped connecting-rod bearings could be set extremely tight and yet not seize was because of the hills and valleys, or lubricant pockets, left by the curved scraping tool.

Drop Forging Described

Too often, Mr. Harrison pointed out in his paper, the forge shop is slighted by management despite its obvious importance to modern manufacture. This author gave the following reasons in answer to the question "Why Drop Forging?"

"1. Equal or greater strength at lower unit weight and bulk.

2. Greater consistency of performance than is possible with castings.

3. Wider range of heat-treatment available (durability under repeated stressing).

4. Better wearing qualities.

5. Easier machining qualities.

6. Reduction of surplus metal to be machined off due to reduction in thickness of skin and scale destruction to tools.

7. Precise control over size of finished piece.

8. Ability to reproduce a given result consistently."

He then outlined briefly the history of drop forging and gave present day production requirements for this process. He showed, as well, that modern hammers, while more powerful, accurate, productive and economical, are far safer than their predecessors.

Mr. Harrison continued with a description of modern forging technique giving a layout of straight line production typical of many in use today.

In discussing die design he stated:

"The dies for many modern forging jobs are made with 3 deg. of draft, whereas but a short year ago it was exceptional to find any forge shop man who would sanction anything less than 7 deg. draft. It will be readily realized that this change has materially reduced the number of cubic inches of metal removal which was formerly thrown up against the machine shop.

"The transition from 7 to 3 deg. draft practice was only made possible by the use of forging hammers with accurate alignment maintained between top and bottom dies and the ability to strike a blow with quick getaway which is more in the nature of a smart rap than the dead falling weight type blow which characterized earlier designs of hammer.

"As is generally known, it is recognized practice, to lubricate dies between operations to facilitate the removal of the forged job quickly enough to prevent it from burning the finer sections of the die contours.

"As the hot metal is forced into the die by the blow of the hammer this lubricating oil is instantaneously gasified at high pressure, and if the nature of the hammer blow is such that it is instantaneous in action, then the gases which are generated between the die and the hot metal are generally sufficiently high in pressure to eject the work from the die and thereby facilitate the hammerman's manipulation of the work. Older style hammers, which delayed the return of the ram, permitted dissipation of the gases, resulting in a general slowing up of the forging operation, due to the operator having to manipulate the work to get it out of the die."

Factors which govern the selection of correct size and capacity of forging hammers were given by Mr. Harrison as follows:

A. Required die face area (governing ram and cap face areas).

B. Total cubic inches displacement of metal to be effected (governs the power required in the tool).

C. Amount of preliminary drawing, fullering and bending (governing type of tool — steam, air or board).

D. Thin section forgings which naturally cool rapidly can generally be made more economically on board hammers due to lower maintenance cost occasioned by relative ability of the board type hammer to adapt itself to the load (board hammers are available up to 5,000 lb. capacity).

E. Weight of die to be manipulated (has bearing on amount of power required).

F. Possible multiplicity of impressions in the dies (has bearing on size of ram).

G. Availability of different sources of power (air, steam, electricity, or line shaft).

H. Economic balance between size capacity of tool and anticipated work load (continuous production usually justifies a heavier tool.)

In concluding features of modern hammer design were described. One important development has been the design of a cylinder which would consistently impart the proper speed to the ram without destructive action on the internal structure of the job. On high production forging work it has been shown to be economically desirable to keep the ratio of that ratio of falling weight to anvil assembly at not less than 25:1.

Cutting Tool Components

An interesting series of tests and equally interesting conclusions were described by Prof. Boston and his coworker Mr. Kraus. The experiments consisted in measuring the tangential, longitudinal and radial components of the cutting force used in turning steel. Readings were taken on a Monarch lathe using a special tool block.

For most of the runs low carbon (0.21 per cent) machine steel was used. For purposes of comparison, however, readings were taken on two tool shapes turning annealed SAE 3135 steel.

Tool bits were of $\frac{3}{8}$ in. high-speed steel, ground in eleven different shapes. During the runs, feed and depth of cut were varied in four steps each and when plotted on log-log paper were found to be straight lines. This made it possible to determine constants and exponents for a general formula of the form $T = C F^a D^b$, giving the relation between each of the three force components and feed and depth of cut. It was then possible to show graphically the relations between these exponents and constants and various changes in tool bit shape.

To round out the data an independent run of one tool shape while changing the cutting speed in eleven steps from 22 to 320 ft. per min. Results below 50 ft. per min. were erratic because of the effect of the built-up edge. During this run, tool temperatures were obtained by a tool-work thermocouple and recorded. At 56 ft. per min. the temperature was approximately 650 F., rising to a maximum of 1000 F. at 210 ft. per min. and dropping to 900 F. at 320 ft. per min.

Many of the conclusions had to do with the effect of tool shape on cutting force. Both longitudinal and radial force increased somewhat with an increase in cutting speed, but the tangential force remained practically unchanged. The temperature of the chip, as determined by temper colors, changed less than 50 per cent in the range from 90 to 320 ft. per min.

EDITORIALS

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K. H. CONDIT • F. H. COLVIN
EDITORS

BUSINESS OPINION CRYSTALLIZES

NEW DEAL philosophy has been hard for business men to accept, from the first. In the early days of the Roosevelt Administration, however, many of them thought there might be something in it, and reserved judgment.

But the differences of opinion that made for vigorous discussions in meetings of merchants and manufacturers a year ago have crystallized into determined opposition to the New Deal policies that have failed. And, men being what they are, the opposition to policies has been extended to individuals as well.

A measure of the extent to which sentiment has crystallized is found in the Chamber of Commerce referendum votes announced last week. They were fifty to one against the New Deal on questions based on fundamental principles.

More specific objections are phrased in the report of the Committee on Relation of Government to Industry of the National Association of Manufacturers. This report is being considered this week at the New York meeting of the Association.

On the question of a revival of NRA the Committee has this to say: "As between the anti-trust laws, which have been judicially interpreted over a period of forty-five years, on the one hand, and new legislation of the type of the National Industrial Recovery Act, which purported to grant limited exemptions from the anti-trust laws, we unhesitatingly choose the anti-trust laws."

This is certainly positive enough for any one. Other equally positive recommendations are these:

1. Opposition to proposed arbitrary shortening of the work week, as proposed in the 30-hour week bills.

2. Opposition to the Ellenbogen bill, the O'Mahoney bill for controlling industry through a system of licenses, and the Walsh Government Contract bill.

3. A continuing campaign for repeal of the Wagner Labor Disputes Act.

4. Opposition to Federal use of corporate devices to enter into business operations, except in rare cases.

5. Abandonment of the unsound principles underlying the share-the-wealth tax act.

6. Avoidance of extra-legal methods, such as proposals to enforce Federal regulations of local matters by barring use of the mails.

7. Repeal of the Guffey Coal Act.

8. Postponement of the effective date of the tax burdens of the Social Security Act in order that the problems involved may be carefully and impartially considered, and only so much of the Act preserved as careful study shall indicate should be preserved.

These recommendations will probably be changed somewhat at the main meeting. As they stand, however, they certainly represent in substance the crystallized opinion of the business community. It is high time they were put on record.

Engineers Lead

ENGINEERS are taking the lead in forming national opinion. To name but one of the outstanding examples, Ralph E. Flanders, retiring president of the American Society of Mechanical Engineers, gives further evidence of this movement in his presidential address before the annual meeting of that body. It is a straightforward attack on defeatism and restriction of production. We are printing the substance of it on pages 888 and 889.

Simultaneously, another engineer, James W. Hook, is presenting the report of the National Association of Manufacturers' Committee on Relations with Government before that body. This report is an equally forthright statement of principle on which thoughtful citizens can unite. We are referring to it in the editorial on the previous page.

Both of these engineers are machine tool builders, and leaders in the metal-working industry. Mr. Flanders will be succeeded as president of A.S.M.E. by W. L. Batt, also well known in the machinery field, here and abroad. If we broaden the term engineering, as we use it, to include the metal-working industry, as they do in England, we find nearly a third of the new finance committee of the Republican National Committee made up of engineers.

In their own meetings the engineers have been urging each other for years to assume leadership in public affairs. Here is ample evidence that the urging has been effective.

Chips

WASHINGTON—Hopkins strives desperately to get people off relief rolls as Roosevelt tells mayors federal relief will continue . . . Ickes asks oil men to halt Italian shipments, admits he has no power to enforce his request . . . Eccles says Federal Reserve sees no occasion to check stock market boom so long as bank credit is not involved . . . Stock market declines . . . Federal Reserve Board publishes optimistic bulletin chronicling business advances . . . Representative Buchanan, House Appropriations chairman, promises budget reduction "all along the line, if I can make it" . . . Secretary Roper says that there can no longer be any doubt that recovery is here . . . Iron & Steel Institute joins other trade bodies in refusing invitation to Berry meeting.

FOREIGN—Enforcement of League sanctions against Italy brings curtailment of railroad service, nationalization of gold, rationing of fuel . . . Ethiopian campaign is pushed mercilessly and threats of retaliation are made against countries siding with League . . . Japanese military and civil authorities disagree on North China policy . . . Britain is told to keep out . . . Chinese leader (pro-Japanese) proclaims autonomous state made up of 18 counties of Eastern Hopei province . . . France and Great Britain hold up oil embargo which is dreaded by Italy . . . Authorities call Brazil uprising communistic . . . British see no hope of accomplishment in coming naval restriction conference . . . New German law authorizes annual military training of all men between 18 and 45 . . . Employers must give them "vacation without pay" when they are called and hold their jobs.

FINANCE—Foreign Trade Council urges repeal of silver act . . . U. G. I. of Philadelphia directors vote to fight utility holding company act, refuse to register with SEC . . . Other utilities also refuse, Consolidated Gas sues SEC to test act . . . Two billion stabilization fund due for extension . . . SEC enjoined from revealing "trade secrets" . . . September railroad income exceeded interest charges.

INDUSTRY—Jesse Jones expects to lend railroads money to pay welfare taxes next year . . . Pittsburgh Coal Co. starts legal fight against Guffey Act . . . Big food and tobacco companies join attacks on AAA . . . Southern cotton mills preparing to fight Wagner labor law . . . U. S. Lines asks bids on liner similar to S.S. Washington . . . G. E. to end unemployment insurance plan because of passing of Security Act, announces reestablishment of vacations with pay in 1936 for hourly wage earners . . . Lewis resigns as vice-president of A. F. of L., still a member and his union is still in . . . Railroads are buying more steel . . . Kansas City judge hears first argument against Wagner labor law.

TRADE—Atlantic freight war averted as members of conference withdraw resignations after satisfactory arrangement for handling German blocked marks is concluded . . . Ford will build $750,000 assembly plant in New Zealand . . . Pacific air mail service opened as China Clipper of Pan-American Airways flies to Manila . . . Washington considering restriction on German imports because of manipulation of marks . . . Hull moves to block oil sales to Italy by warning debtor ship owners.

INDICATORS—Steel production continues to push ahead to higher levels but prices change little . . . Electrical energy output sets more new high records . . . Business Week's index climbs from 68.3 to 69.1 consolidating its gains over figures of the last four years.

Politics Dominates Washington; Railroad Prospects Improve

WASHINGTON—Everything's going to be all right in 1936—that is if the Administration can make it so. Brain trusters and left wing advisors will give way to practical politicians, a little impatient perhaps, but comforted by the assurance that such tactics are needed to assure them four more years of endeavor in which to round out their plans.

Conservative Democrats will be mollified. Business will be reassured by moves to show that Washington is working toward a balanced budget and is friendly toward restoration of prosperity through rejuvenation of private enterprise. Thus will an attempt be made to wet the ammunition of those who would turn the incumbents out by cries of unsound fiscal policy and unwarranted interference with industry.

G.O.P. leaders continue to be distrustful of this promise of a real "holiday." They have started the 1936 campaign by naming a campaign fund committee headed by William B. Bell, president, American Cyanamid Co., and including in its membership such industrialists as Henry D. Sharpe, president, Brown & Sharpe Manufacturing Co., E. T. Weir, chairman of board, National Steel Corporation, Edward L. Ryerson, president, Joseph T. Ryerson & Son, A. W. Robertson, chairman of board, Westinghouse Electric & Manufacturing Co. and J. F. Lincoln, president Lincoln Electric Co. On December 16 the Republic National Committee will meet to fix place and date for the 1936 convention.

New NRA Feared

With the American Iron & Steel Institute joining the Automobile Manufacturers Association and other important groups in refusing officially to attend Major Berry's December 9 meeting for the "furtherance of prosperity" industrial fingers are decidedly crossed. Employers are critical of the agenda, see in it a strategy whereby Berry will outline his plans and break the gathering into small industry round table meetings without giving anyone a chance to inject outside ideas. The objective would be to give labor representatives present at the round tables opportunity to bring back recommendations that will fit together and into their own ideas. Result: a strong move to restore something of the control that faded with NRA, with business ostensibly concurring but practically ignored. Aggressive opposition by industrial representatives and an inclination toward pulling its punches for political reasons by the Administration may forestall an immediate restoration of regimentation.

R.R.'s Plan Reequipment

PWA's $3,000,000 loan to the Illinois Central Railroad for air conditioning and maintenance work on equipment attracts attention to perceptible improvement in the rail equipment industry. There is slight prospect of more PWA financing for this purpose as the I.C. loan was made from old appropriations now fast dwindling. RFC is still a source of funds, and there is a remote possibility that Transportation Coordinator Eastman's office may interest private capital in setting up an equipment rental plan that would stimulate car and locomotive building. Under study in Washington for several months, this plan would finance installation of new equipment at a rate of 90,000 cars a year for four years and 1,320 locomotives a year for five years.

Immediate prospect of new business in this direction, however, is coupled with the inclination of private bankers to regard more hopefully the situation of many railroads individually and the confidence evidenced by several roads in embarking upon car building and repair programs. Railroad maintenance deferred during depression years now runs into fabulous sums that have little significance independent of actual prospects of increased traffic incident to the upward trend in business and additional tonnage that may be gradually recovered as a result of federal regulation of interstate trucking.

While there is likely to be no actual shortage of rolling stock for some time to come, the serviceable freight car surplus has dropped to the lowest figure since 1929 and weekly loadings of 700,000, if sustained, will develop shortages in some places and in particular types of equipment.

No substantial volume of railway equipment business is likely to develop during the remainder of this year but tentative budgets of railroad managements presage substantial contracts early in 1936. Pennsylvania is planning a $30,000,000 car building and repair program, including 10,000 new freight cars and will also, it is understood, build 100 locomotives. Burlington's plans include 1,200 new freight cars and three locomotives. While most of this construction will be handled by these roads in their own shops, there will be considerable business for outside suppliers of parts and accessories.

Reports of freight car projects, large and small, are coming in steadily from various parts of the country, and railroad inquiries are growing in number. The Missouri Pacific's rehabilitation program calls for the purchase of 4,000 freight cars and repairs to present equipment. The Southern Pacific has authorized a $1,100,000 air-conditioning program for next year. Work has already started on its own cars and, in addition, arrangements are being made for an extension of the air conditioning of pullman cars operated in Southern Pacific trains. M-K-T is reported to be considering purchase of 1,000 fregiht cars; also the scrapping of 600 freight cars, 25 passenger cars and 15 locomotives. The Frisco is reported to be preparing bids on repair parts for 500 hopper cars and plans re-equipping 600 box cars with steel roofs. The New York Central is repairing 1,500 cars in its own shops. The fact that small orders are drifting into the market from roads without facilities for new construction work is important.

Taxes are coming. Who will pay them? Industry, of course—in the final analysis no one else can. Are you interested in curbing the mounting federal deficit, in alleviating the headaches ahead? If so, see your congressmen before they become embroiled again in the whirl of Washington.

A.S.M.E. Officers Upheld on Engineering Index

Officers and members of the council, the American Society of Mechanical Engineers, were cleared of charges made by John Parker, a member, that they had wasted the society's funds in publishing the Engineering Index. Phillip J. Sinnott, the referee, ruled that "no property or funds had been misappropriated or diverted to any other purpose than for which the society was incorporated." The index was suspended on January 1, 1934 after an aggregate loss of $215,730 due to the depression. The membership organized a separate non-profit company to continue publication.

German Production at 1928 Level But Apprehension Grows for the Future

BERLIN—Supported by the continued rise of industrial production—in September, 1935, the general production index (102.8) exceeded for the first time the prosperity level of 1928—German machinery output and sales registered new records during the last few months. But behind this encouraging and promising picture uneasiness and apprehension are growing in regard to the immediate future. The possibility of an open setback is openly discussed and recent official employment forecasts have been remarkably pessimistic. Warnings by government spokesmen are particularly frank.

Total machinery sales rose 6.8 per cent from December, 1934, to June, 1935. During the first half of 1935 they were 54 per cent higher than the year before. The number of workers rose 10 per cent from January to August inclusive, and the number of hours worked rose approximately in the same proportion. It is believed that the present rate of operation can be maintained until the end of the year.

The high rate of employment is still occasioned solely by domestic orders which during the first half of the year were 63 per cent above 1934 levels. Public works, armament orders and execution of orders placed by manufacturers prior to January 1, 1935, in order to secure the benefit of tax exemptions that expired on that date—all contributed towards this satisfactory result. Reports from the export field were not so satisfactory despite scattered signs of improvement in certain specific lines. During the first nine months of 1935 the value of machinery exports was 2.0 per cent lower than during the corresponding period of 1934. Because of lower prices the tonnage of machinery exported showed a small increase, 5.1 per cent.

Auto Output a Record

The automobile industry continues an important factor in the domestic machinery boom. There are no signs of relaxation as far as this "most favored" industry of the Hitler régime is concerned. September production figures touched new highs. They were even higher than the July figures, so far the highest on record. They exceeded 1934 production figures by 76 per cent in regard to passenger cars and by as much as 94 per cent for trucks. During the first nine months of 1935 the industry turned out 157,000 passenger cars—more than total production of 1934. The number of trucks produced was 27,900—49.9 per cent above the 1934 figure. Motorization of the new German army accounts for a considerable, though an unknown, part of these figures. Private demand is still satisfactory and the overdue replacement of cars bought in the prosperity years is expected to offer the market a new impetus.

"Replacement Deficit" Grows

There is, as in other countries, a large and unsatisfied need for modernization of equipment and retooling in most German industries. The German Statistical Bureau recently released interesting figures bearing out this contention. They show that the "replacement deficit" originated in 1930, and that even in 1934 the investments in new equipment were lagging behind normal depreciation.

	1929	1930	1931	1932	1933	1934
	(in million marks)					
New and replacement investments by industry..	2019	1575	890	449	520	950
Normal depreciation and replacement needs....	1614	1611	1521	1320	1300	1300
Depreciation of industrial equipment not covered by new investments.....	....	36	631	871	780	350

Thus, according to the Statistical Bureau, the aggregate replacement demand that has accumulated during the last five years exceeds 2½ billion marks. Private estimates put it above 3 billion marks. Yet in order that this potential demand can be transformed into actual machinery orders, two essential conditions must be fulfilled. Manufacturers must look with confidence into the future and they must be able to finance their new investments. In both respects the outlook is gloomy. The state-subsidized boom based on public works and rearmament is obviously nearing its end. The hope that it might be superseded by a "private boom" is not very great. Uncertainty about the currency situation, acute food shortage, stagnant export trade and marked setback in the demand for consumers' goods, all these factors have a deterring effect upon manufacturers who were planning to expand or modernize their plants.

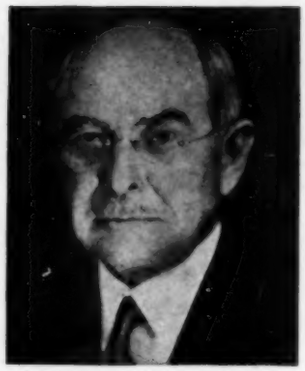
The financial aspect of the situation is of still greater importance. The state-financed boom of the last three years has improved the financial position of many German concerns. Yet their domestic profits have been curtailed by losses on foreign business in spite of Dr. Schacht's export subsidies. Their liquidity is in many cases illusory, the liquid assets being frozen in government "employment bills."

The prospects of borrowing in the open market or from the banks the capital needed for extension or modernization are uncertain. The Reich has monopolized all the capital resources of the country for its own needs and the market has practically been, and still is, barred for private issues.

The numerous government prohibitions for the erection of new plants and extension of old ones, although it does not expressly forbid the replacement of existing machines (provided the old ones are scrapped), nevertheless unfavorably affects a large number of industries. The depressed state of the printing machine industry, though by no means typical, is nevertheless characteristic for the obstacles which German machinery builders often have to face. It should be noted that the German printing trade has been severely hit by the suppression of a large number of newspapers and magazines under the Nazi régime.

Shortsighted Policy

Monthly domestic orders for printing machinery averaged 820,000 marks during the third quarter of 1935 as compared with 1,500,000 marks during the same period of 1934, a decline of nearly one-half. Simultaneously, foreign orders declined from 1,670,000 marks to 1,000,000 marks. The position is aggravated by the fact that the Printers' Association has set up a special organization to supervise all machinery orders of the industry. This organization seems to see its main object in checking orders with a view to reduce the general excess machinery capacity in the industry. This, it believes, is one of the main causes of its present deplorable position. Makers of printing machinery complain that this state of affairs has led to a complete stagnation in the development of new models. For this reason they are rapidly losing ground in foreign markets in competition with British and American manufacturers.



E. W. RICE, JR.

E. W. Rice, Jr. Helped to Build General Electric

Edwin Wilbur Rice, Jr., who in association with the late Charles A. Coffin played a conspicuous part in the building of the General Electric Company, died November 25 at the age of 78. He was one of the pioneers of electrical development in the United States. More than 100 patents were issued to his credit. Their range is so wide as to embrace practically the entire field of electrical operation.

Mr. Rice held many executive positions with the General Electric Co. He joined Prof. Elihu Thomson in 1880 when the American Electric Co. was formed to manufacture arc lamps and dynamos, and went with Mr. Thomson when the Thomson-Houston Electric Co. was organized to take over the American Electric Co. At 22 he was plant superintendent and remained in this position until 1892 when the present General Electric Co. was formed by consolidation of the Thomson-Houston Co. and the Edison General Electric. In 1896 he was made vice-president in charge of manufacturing, later becoming senior vice-president; in 1913 he succeeded Mr. Coffin as president, and in 1922 was made honorary chairman of the board.

Foundry Equipment Gains 9 Per Cent in October

Orders taken in October by foundry equipment manufacturers were 9 per cent above September business. Net orders for the month reached an index of 140.0 as against 128.4 in September. Shipments lagged at 119.7 as compared with 124.7 in the previous month, accounting for a sharp increase in unfilled orders which rose to 164.7 from 144.5. Twenty-three manufacturers contributed reported to the Foundry Equipment Manufacturers Association.

Fourth-Quarter Auto Employment Is Greatest in Several Years

DETROIT—With the passage of November, evidence accumulates that the automobile industry is working toward the greatest year since 1929. The final quarter production estimates run in the neighborhood of 1,000,000 units, which, taken with the output of '35 models will bring the calendar year close to the 4,000,000 mark. Sales of 190,000 units are anticipated for October and schedules of 350,000 are indicated for both November and December. Although factories were further along with new model production prior to the show date, November 2, than in previous years, shortages are reported from all makers. This shortage is especially acute in trunk models.

Sales at the New York, Detroit and Chicago shows are reported from 30 to 40 per cent ahead of the last year's figures. The Lincoln Zephyr is being assembled at the rate of 50 per day with a goal of 150-200 per day by the first of the year. Output of the Ford V-8 is being worked toward a goal of 5,000 per day. Chevrolet is operating at peak; Dodge is turning out 1,000 per day; Buick 750-800, and December is scheduled to be the second largest month in Oldsmobile's history. Indicative of the recovery of sales in the higher-priced field are the 5,000 cars ordered for December delivery by Lincoln dealers. Packard retail sales in October were the largest in any month since August 1929. Chevrolet reports that sales for the first two days following the show were more than double the first ten days following any January introduction.

While apprehension is expressed in some quarters that a slackening will show up in December, especially in view of annual inventory period, it must be remembered that parts stocks are practically non-existent. Last year these stocks existed, but sales so far

Industrial Review

• Reports from the leading industrial centers of the country indicate that machinery and machine tool orders held up well during November and promise to do about as well for the rest of the year. The trade is watching the plans for the Berry-NRA meeting in Washington next week in an effort to determine whether it will result in a setback to the business recovery that is moving along so smoothly now.

• From the New England section of the eastern territory word comes that business has dropped off somewhat but that inquiries are still coming in in good volume. The Metropolitan district is in about the same situation. In Philadelphia, on the other hand, there has been some small improvement in actual orders. Here the future looks quite promising. November business in Pittsburgh saw a considerable improvement over the business booked in September and October and distributors there look forward to a good month in December. The feeling is that prospects are better than they have been at any time since 1929.

• Manufacturers and distributors in Cleveland report a steady continuance of the good business that has prevailed recently. Inquiries for machine tools are piling up in Detroit and a fair number of orders of moderate size are being booked. Toledo also reports brisk business. Inquiries are coming in regularly and from a variety of industries.

• Indianapolis reports good business in replacing obsolete equipment and also several instances of plant expansion. Here too, orders are from a diversified list. While the general situation in Cincinnati seems to be encouraging there has been some recession both in inquiries and in orders. December business is expected to be lower but still fairly satisfactory. In St. Louis orders are fair and there is a strong undercurrent of inquiry.

• Both October and November were excellent business months in the territory served by Chicago but closing is getting to be a little more difficult than it has been. Milwaukee also notices a slump in orders taken during the last few days, but looks forward to better business after the first of the year. Business has dropped off somewhat since the first of November on the West Coast, but the drop is attributed to seasonal influences. The threatened machinist's strike which may break in January has also had an effect.

"Safety" Overalls—With its shop put in first-class condition the Fosdick Machine Tool Co. wanted its men likewise. Clean overalls furnished each Monday morning cost the men fifteen cents, the company ten cents. Designed without buckles or straps these overalls bear the slogan "Safety First" on the front as a constant reminder

this year have prevented their accumulation, and should sales drop considerably these necessary banks would have to be built up ahead of spring business. Whatever the result, it is clear that the industry will provide the greatest fourth-quarter volume of employment in recent years. For the state of Michigan, employment increased 53 per cent the middle of October as compared with 1934. In Detroit, the index for the middle of November was 107.5 per cent as compared with 51.9 per cent a year ago.

Shortages of skilled productive labor are being reported. One maker had to tear down 200 motors because some tightening operations were unskillfully done. Workers from other sections of the country are flocking to Detroit, but applicants for work are generally unskilled which does not help the situation but only increases the welfare burden. The loss of, or absence, of skill in such a large group of applicants for work calls for an extensive rehabilitation program. The apprenticeship program for Detroit, described in a recent issue, is progressing favorably. Several companies are cooperating and some 1,000 apprentices are expected to be working within a few weeks. O. F. Carpenter of the Detroit Board of Education is now with the Detroit Employers Association as director of apprentice training.

Of outstanding significance to the industry is the trade agreement between this country and Canada, signed November 15. The final effect is impossible to predict, but cheaper cars for Canadian buyers will result. The Ford Motor Company of Canada has already announced reduction in prices.

The strikes at the Motor Products Corp. and the Mather Spring Co. will adversely affect the employees in the long run. Customers are diverting their work to other plants, and fewer men will be needed at these two plants when the difficulties are settled. It is estimated that only one-half of the workers formerly employed at the Toledo Chevrolet plant are now required. Thus strikes at so-called "vulnerable" plants can easily be circumvented by the purchasers.

Exports of Machinery During October, 1935

	October 1935	September 1935	October 1934
Electrical machinery and apparatus	$7,256,235	$6,099,926	$5,912,329
Power generating machinery (except automotive and electric)	911,585	762,006	573,787
Construction and conveying machinery	682,855	684,891	544,874
Mining, well and pumping machinery	2,430,059	2,211,046	2,342,213
Power-driven, metal-working machinery	2,624,958	1,824,871	1,290,407
Other metal-working machinery	324,544	174,197	166,158
Textile machinery	862,542	739,157	543,907

Exports of Metal-Working Machinery During October, 1935

	October 1935	September 1935	October 1934
Engine lathes	$124,049	$45,357	$56,532
Turret lathes	105,906	68,936	47,479
Other lathes	72,221	100,786	28,651
Vertical boring mills and chucking machines	69,222	56,364	10,053
Thread-cutting and automatic screw machines	236,116	68,661	83,606
Knee and column type milling machines	81,271	137,895	52,177
Other milling machines	205,389	89,615	57,084
Gear cutting machines	128,110	118,849	114,290
Vertical drilling machines	7,512	15,229	30,391
Radia drilling machines	6,700	24,534	5,895
Other drilling machines	102,382	87,808	35,825
Planers and shapers	33,354	31,564	7,400
Surface grinding machines	133,509	19,925	23,303
External cylindrical grinding machines	107,606	47,790	30,004
Internal grinding machines	164,878	27,283	41,626
Tool grinding, cutter grinding and universal grinding machines	75,491	73,272	56,479
Other metal grinding machines	61,705	85,407	44,364
Sheet and plate metal working machines	115,357	103,013	139,846
Forging machinery	68,604	99,374	98,766
Rolling mill machinery	283,487	237,448	90,061
Foundry and molding equipment	112,303	26,631	32,958
Other power driven metal-working machinery and parts	329,786	259,130	203,617

Other Metal-Working Machinery

Pneumatic portable tools	$69,000	$61,066	$61,937
Other portable and hand or foot operated metal working machines and parts	46,283	48,454	29,852
Chucks for machine tools	20,310	16,300	7,137
Machine operated pipe and thread cutters, stocks, dies, taps, and other machine-operated cutting tools	153,050	30,223	40,271
Other metal-working machine tools	35,901	18,154	26,961

National Defense and Home Market Absorb English Machine Tools

BIRMINGHAM—For months the machine tool industry of this district has been engaged at full pressure, following upon all-around improvement in general engineering and the principal domestic machine-tool using trades. Current demand for many classes of machine-shop equipment is greater than productive capacity, according to William W. Heard, American consul at Birmingham. Overtime is being worked in many sections of the industry, and there is a marked shortage of skilled labor. Delivery of the more commonly used types of lathes cannot be promised under a period of eighteen weeks.

The present position is due principally to the intensive production of aircraft components and accessories in connection with the recently announced air-defense program of the British Government. Other national defense measures are also causing greatly increased activity among local machine tool manufacturers. The local industry is also busy producing equipment for the domestic automobile industry, in connection with which there has recently been considerable plant extension following increased car demands during the past year. Widespread reconstruction programs of British railroad concerns and the improved position of the electrical and radio trades have also added to local business.

Home Tools Gain

Most of the recent orders for locally made machine tools have been from the home market. Some of the more important local products in current demand include boring mills for railroad work, cold sawing machines, forging machines, diamond boring machines, and two-, three- and four-way drilling heads for the automobile industry; thread grinders and combination turret and capstan lathes. There is also a continued demand for cold-heading and bolt trimming machines for use in the manufacture of screw products; the cold-heading process now being widely used in the domestic production of these goods. Increasing interest is also being shown in 13-in. lathes.

An important installation of automatic factory equipment has recently been made by Stewarts & Lloyds, Ltd., in connection with their new Bessemer steel tube works at Corby, Northamptonshire. The equipment includes three power shearing machines operating in conjunction with electric gear which controls the entire process of tube manufacture.

An extensive machine shop equipment recently installed by the Austin Motor Co., Ltd., Birmingham, at a cost of £40,000, includes four moving chassis assembling tracks of a total length of 1,050 ft., together with a conveyor system approximately a mile in length which, when in operation, may be carrying up to 300 power units at one time. This extension of productive plant has also involved the installation of numerous classes of specialized machine tools.

American Types Built

One important local machine tool firm (George H. Alexander Machinery, Ltd., Birmingham) has recently purchased the machine tool business associated with the former liquidated manufacturers of "Sunbeam" automobiles at Wolverhampton, and has transferred this business to new and extensive premises which it has acquired at Dudley, England. The primary object of this move is to extend the manufacture of both American and other machine tools which George H. Alexander Machinery, Ltd., has developed within the past few years as additional to its original importing activities.

The volume of British metal-working machine tool exports has shown a constant decrease since the sharp rise in July. Official figures for September show the total value as £151,801, as compared with £180,843 in August, and £209,642 in July. To an important degree, this decline is associated with the diminution of trade with Russia, which has virtually completed its reconstruction program. However, the general decline in exports is in no small measure due to increased home demands, and the impossibility of effecting quick deliveries commensurate with overseas demands.

Although machine tool imports into Great Britain during the present year have appreciably increased as compared with 1934 and 1935, the figures for September are less than those of the previous month. In local trade circles it is felt that this largely follows upon conditions similar to those affecting British export trade; that is, increased home demands in the principal machine-tool exporting countries are making it impossible to effect speedy delivery to the British market. This is particularly the case with Germany at the present time. The growing tendency toward the domestic manufacture of American and other foreign machine tools, which have hitherto been imported into Great Britain, is also adversely affecting the volume of direct importation of these products.

PERSONALS

New President of Metal Cutting Tool Institute

Backrach

W. B. McSKIMMON

W. B. McSKIMMON, president of the Union Twist Drill Co., Athol, Mass., was recently elected president of the Metal Cutting Tool Institute.

RALPH E. FLANDERS, president of the Jones & Lamson Machine Co., and president of the American Society of Mechanical Engineers, has been elected a director of the National Life Insurance Co., of Montpelier, Vt.

SYDNEY BUCKLEY has been elected president of the Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y. Mr. Buckley was formerly vice-president and general manager of the Niles Division at Philadelphia. He succeeds the late FRANK A. HATCH, who died Oct. 15. HERBERT W. GLEDHILL, formerly manager of the Philadelphia district office has been elected vice-president and general sales manager and will also be located at Montour Falls.

H. V. BUTTERFIELD has been appointed general manager of the George Leland Electrical Co., Ltd., Toronto, Canada, manufacturer of fractional-horsepower motors. Mr. Butterfield was formerly editor of *Canadian Machinery and Manufacturing News.*

OBITUARIES

B. D. PERKINS

BERTRAM D. PERKINS, treasurer, Perkins Machine Co., Warren, Mass., died Nov. 24. In 1902, Mr. Perkins, his father, his brother and COL. A. A. POPE incorporated Perkins Machine Co., then in Boston. They moved to Warren, Mass., in 1903. Prior to that he had been associated with Col. Pope in the Columbia bicycle business. Mr. Perkins was 61 years of age.

WILLIAM CARLTON READ, for 25 years associated in an official capacity with units of the Union Carbide & Carbon Corp., with respect to metallurgical and development activities, died recently at the age of 47. He became associated with the Union Carbide Co. in 1910. In 1928 he was assigned to the works manager's department of the company and the Electro Metallurgical Co., in New York. Mr. Read had been connected with many major research developments in the production and utilization of ferro-alloys and alloying metals.

BUSINESS ITEMS

Control of the Johnson Motor Co., Waukegan, Ill., manufacturer of outboard motors, pumps and gasoline engines, has been secured by STEPHEN BRIGGS of Milwaukee and Detroit. Mr. Briggs is chairman of Briggs & Statton and the Outboard Motors Corp., but it is understood that neither of these concerns was connected with the transaction.

Joseph T. Ryerson & Son, Inc., Chicago, has appointed THOMAS W. DELANTY as manager of eastern railroad sales. He has had much experience in the machinery division of the company.

H. Allison Co., Inc., New York, N. Y., manufacturer of abrasive cutting wheels for grinding, has acquired the Atlas Iron Works plant on Island Brook Ave., Bridgeport, Conn. Alterations are to be made and manufacturing operations will begin during February. P. R. SHUTLEWORTH, secretary of the company, negotiated the purchase.

The executive offices of the Link-Belt Co., for many years located at 910 S. Michigan Ave., Chicago, have been moved to the Bell Building, 307 N. Michigan Ave., where they will occupy the entire 23rd floor, and the north half of the 21st floor.

The Lincoln Electric Co., Cleveland, has opened offices at Peoria, Ill., and at Memphis, Tenn. The Peoria office at 923 South Washington St., is under the direction of W. I. MISKOE. The office at Memphis is in charge of O. B. FARRELL.

Elmira Precision Tool Corp., Elmira, N. Y., has been chartered by JAMES E. PERSONIUS, WILLIAM P. RODGERS and DEFOREST E. FOX, to take over and operate the former Willys-Morrow plant in that city, recently sold at public sale to Elmira Industries, Inc., for $250,000.

North & Judd Mfg. Co., New Britain, Conn., has purchased the Krischner Mfg. Co., New Haven, with plant at 67 Franklin St., and a factory at Brooklyn, N. Y. Negotiations were completed Nov. 14. Operations will be continued in both plants.

PATENTS

November 12, 1935

Metal-Working Machinery

Degreasing. Joseph Savage, Weston Point, Runcorn, England, assigned to Imperial Chemical Industries Ltd. Patent 2,020,335.

Boring Machine. Charles E. Sorensen, Detroit, Mich., assigned to Ford Motor Co. Patent 2,020,439.

Shearing Mechanism. Gardner L. Winters, Dormont, Pa., assigned to Aluminum Company of America. Patent 2,020,491.

Grinding Machine. Hans Ernst, Cincinnati, Ohio, assigned to Cincinnati Grinders Incorporated. Patent 2,020,541.

Grinding Machine. Frederick S. Haas, Cincinnati, Ohio, assigned to Cincinnati Grinders Incorporated. Patent 2,020,547.

Bolt Machine. Michael J. Riley, Cleveland, Ohio, assigned to The National Machinery Co. Patent 2,020,657.

Machine and Method for Manufacturing Bolts. Earl R. Frost, Tiffin, Ohio, assigned to the National Machinery Co. Patent 2,020,658.

Bolt Making Machine. Earl R. Frost, Tiffin, Ohio, assigned to the National Machinery Co. Patent 2,020,659.

Bolt Making Machine. John H. Friedman, Tiffin, Ohio, assigned to the National Machinery Co. Patent 2,020,660.

Interlocked Propelling and Clamping Means for Mobile Drills. David C. Klausmeyer, deceased, late of Hyde Park, Cincinnati, O., assigned to The Cincinnati Bickford Tool Co. Patent 2,020,785.

Machine for Cutting Roller Blanks. Karl L. Herrmann, South Bend, Ind., assigned to The Bantam Ball Bearing Co. Patent 2,020,837.

Transmission and Control Mechanism. Fred A. Parsons, Milwaukee, Wis., assigned to Kearney & Trecker Corp. Patent 2,020,852.

Boring Machine and the Like. John S. Barnes and Paul R. Guirl, Rockford, Ill., assigned to W. F. & John Barnes Co. Patent 2,020,868.

Grinding Machine. Leonard E. Ross, Dallas, Texas. Patent 2,021,024.

Driving Mechanism for Turrets and Like Apparatus. Gunnar Swahnberg, Keene, N. H., assigned to Kingsbury Machine Tool Corp. Patent 2,021,030.

Machine Tool. George T. Huxford, Providence, Frank E. Stratton, Cranston, and Paul G. Heinemann, Providence, R. I., assigned to Diamond Machine Co. Patent 2,021,066.

Indexing Punch Presses. Wilbur L. Merrill and Frederick E. Fisher, Scotia, N. Y., assigned to General Electric Co. Patent 2,021,077.

Tools and Attachments

Combined Work Feeding and Holding Device. Paul Klamp, Canton, Ohio, assigned to the Timken Roller Bearing Co. Patent 2,020,320.

Hydraulic Feed. Herman J. Breitenbach, Cincinnati, O., assigned to the Lodge & Shipley Machine Tool Co. Patent 2,020,765.

Spot Welding Fixture. Elmer J. Gray, Cincinnati, Ohio, assigned to the American Laundry Machinery Co. Patent 2,020,830.

Furnaces

Continuous Heat Treating Machine. Adolph W. Machlet, Elizabeth, N. J., Patent 2,021,072.

November 19, 1935

Metal-Working Machinery

Press Welder for Metal Doors. Malcolm Clark, Warren, Ohio, assigned to The Taylor-Winfield Corp. Patent 2,021,173.

Hydraulic Arm Translating Means for Radial Drills. Lawrence L. Schauer, Cincinnati, O., assigned to the Cincinnati Bickford Tool Co. Patent 2,021,388.

Press for Stamping Blanks. Charles R. Moon, Muncie, Ind., assigned to Ontario Manufacturing Co. Patent 2,021,461.

Duplex Grinding Machine. John Bath and Stanley W. Bath, Shrewsbury, Mass., assigned to John Bath & Co. Patent 2,021,535.

Auxiliary Spindle for Grinding Wheel. John Bath and Stanley W. Bath, Shrewsbury, Mass., assigned to John Bath & Co. Patent 2,021,536.

Lead Screw Correcting Device. Stanley W. Bath, Shrewsbury, and Ernest A. Walker, Worcester, Mass., assigned to John Bath & Co. Patent 2,021,537.

Grinding Machine. Paul S. Jackson, Rockford, Ill., assigned to Sundstrand Machine Tool Co. Patent 2,021,602.

Tools and Attachments

Boring Bar Tool Support. Herman Berg, Cleveland, Ohio, assigned to the Kelley Reamer Co. Patent 2,021,349.

Blank Feeding and Delivering Mechanism. Harry K. Dickermann, Buffalo, and John W. McCarthy, Lockport, N. Y., assigned to F. N. Burt Co., Ltd. Patent 2,021,648.

MEETINGS

AMERICAN ENGINEERING COUNCIL. Annual meeting, Jan. 9-11, Washington, D. C. FREDERICK M. FEIKER, executive secretary, 744 Jackson Place, Washington, D. C.

AMERICAN MANAGEMENT ASSOCIATION. Conference on personnel and industrial relations, Feb. 5-6. Palmer House, Chicago. Association headquarters, 20 Vesey St., New York.

SOCIETY OF AUTOMOTIVE ENGINEERS. Annual meeting, Jan. 13-17, 1936. Book Cadillac Hotel, Detroit, Mich. JOHN A. C. WARNER, secretary, 29 West 39th St., New York, N. Y.

American Machinist
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Carbon-Steel Castings for Miscellaneous Industrial Uses

This abstract of a tentative standard is published through the courtesy of the American Society for Testing Materials. The complete A.S.T.M. specification has the serial designation A 180-35T.

Scope

These specifications cover carbon-steel castings to be used for miscellaneous industrial purposes, as distinguished from carbon-steel castings made for railroad, marine, and high-temperature applications. Six grades of castings are covered: namely,

Grade N-1—Castings not required to be physically tested, nor to be heat-treated except as conditionally provided for in the section on heat-treatment.

Grade N-2—Castings not required to be physically tested, but required to be annealed.

Grade A-1—Castings of this grade as specified by the purchaser, required to be physically tested but not required to be heat-treated except as conditionally provided for in the section on heat-treatment.

Grade A-2—Castings of this grade as specified by the purchaser, required to be annealed and physically tested.

Grade B—Castings of this grade as specified by the purchaser, required to be annealed and physically tested.

Grade H—Castings of this grade as specified by the purchaser, required to be annealed and to be physically tested.

The steel shall be made by one or more of the following processes: open-hearth, electric-furnace, converter, or crucible.

Heat-Treatment

A heat-treatment, either by normalizing or by full annealing, shall be applied to all castings of Grades N-2, A-2, B, and H, and to all castings of Grades N-1 and A-1 when their carbon content exceeds 0.30 per cent (Note 1). Unless otherwise specified, all castings may be normalized or full annealed one or more times, and be given a supplementary heat-treatment by tempering or drawing; all at the option of the manufacturer. At the option of the purchaser, castings so designated by him may be given a supplementary heat-treatment that includes accelerated cooling by liquid quenching, liquid spraying, or air blasting. All those castings that are to be heat-treated in any manner shall have been allowed to cool after pouring to below the critical range.

Normalizing—The procedure for normalizing shall consist of heating the castings to the proper temperature above the critical range for the required time as preliminary procedure for the ultimate refinement of the grain, and cooling in still air at room temperature (Note 2).

Full Annealing—The procedure for full annealing shall consist of heating the castings to the proper temperature above the critical range for the required time as a preliminary procedure for the ultimate refinement of the grain, and cooling slowly in the furnace (Note 2). No casting so treated shall be removed from the furnace until the entire furnace charge has fallen to a temperature as low as 500 F.

Tempering or Drawing—The procedure for tempering or drawing shall consist of heating such castings as have been normalized or full annealed, or given an authorized accelerated cooling, to a temperature below the critical range but not less than 400 F., and cooling by a suitable method to obtain the desired results.

Cooling—The procedure for accelerated cooling by liquid quenching, liquid spraying, or air blasting shall follow heating the castings gradually to a suitable temperature (above or below the critical range) and holding at that temperature for the proper time to obtain the desired results. All castings that have been cooled by liquid contact or an air blast shall be tempered or drawn to relieve cooling stresses and/or strains, unless otherwise agreed to by the purchaser. With the exception of castings of very simple light section design, all liquid-quenched material shall be removed from the quenching bath before the castings attain room temperature, and shall be placed in the heat-treatment furnace for any required tempering or drawing immediately following removal from the quenching bath.

Chemical Composition

Steel used for the castings shall conform to the following requirements as to chemical composition:

Manganese, max., per cent	1.00
Phosphorus, max., per cent	0.05
Sulfur, max., per cent	0.06

An analysis of each melt of steel shall be made by the manufacturer to determine the percentages of carbon, manganese, silicon, phosphorus and sulfur.

Tension Tests

The tensile properties of steel used for castings of the grades that require physical testing shall be determined from the required number of specimens having a 2-in. gage length, conforming to dimensions shown in Fig. 1.

One or more coupons, in the num-

Note 1. The term "heat-treatment" covers any method of applying heat to a metal after it has cooled following pouring. Consequently, the term now is used without regard to whether such heat is applied one or more times, and irrespective of the cooling procedure. The term "annealing" is authoritatively intended to cover either "normalizing" (air cooling) or "full annealing" (furnace cooling).

Note 2. The proper time for holding or "soaking" castings of moderate thickness at maximum temperature in the heat-treating furnace is believed by many persons to be one hour per inch of thickness of the heaviest member.

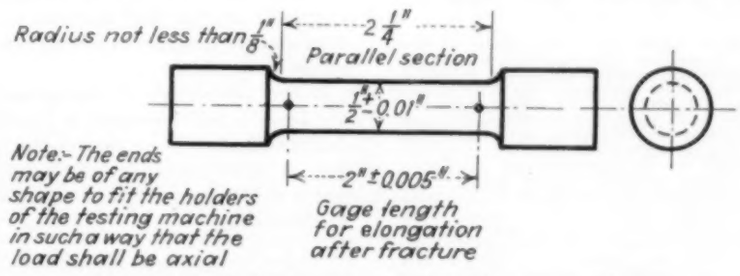

Radius not less than 1/8"
2 1/4"
Parallel section
1/2 +0.01"
2"±0.005"
Note:- The ends may be of any shape to fit the holders of the testing machine in such a way that the load shall be axial
Gage length for elongation after fracture

Fig. 1—Standard 2-in. gage length tension test specimen

Carbon-Steel Castings for Miscellaneous Industrial Uses

	Tensile Strength Lb. Per Sq.In.	Yield Point Lb. Per Sq.In.	Elongation in 2 in. Per Cent	Reduction of Area, Per Cent
Grade A-1, Unannealed (Note 4)	60,000	30,000	22	30
Grade A-2, Normalized or full annealed (Note 4)	60,000	30,000	26	38
Grade B, Normalized or full annealed (Note 4)	70,000	38,000	24	36
Grade H, Normalized or full annealed (Note 4)	80,000	43,000	17	25

ber required for the tension tests prescribed in these specifications, shall be cast separately on a specially designed test block or be cast attached to a commercial casting, in each melt used for manufacture of the castings purchased (Note 3). All test coupons may be cast separately unless otherwise specified or agreed to between the purchaser and the manufacturer. When a coupon is cast attached to a commercial casting, the manufacturer shall be permitted to select the location for the coupon. Minimum tensile requirements shall be as in the above table.

Test Specimens

Such physical test coupons as may have been connected directly or by runners to commercial castings shall remain so attached until the material is submitted for inspection. All physical test coupons shall be heat-treated with the castings represented by them unless the purchaser authorizes separate heat-treatment.

If agreed to between the manufacturer and the purchaser's inspector, tension test specimens may be taken from commercial castings instead of from special coupons.

Tension test specimens shall be machined by the manufacturer and shall conform to the dimensions in Fig. 1.

Number of Tests

One tension test shall be made from each melt in each heat-treatment charge. If any test specimen shows defective machining or develops flaws it may be discarded, in which case another specimen from the same lot[1] shall be substituted.

After the acceptance (for one or more orders) of fifteen consecutive melts containing castings subject to physical tests, the manufacturer may assemble the castings from succeeding melts in groups of five melts each, not exceeding 40 tons in weight per group. Each such group shall be accepted if the chemical analyses and the specimen representing the group fulfill the chemical and physical requirements of these specifications. If this test fails a rehearing shall be granted for the melt represented by the failed specimen, and the other melts retested.

Retests

If the results of the physical test for any lot[1] do not conform to the requirements specified, the manufacturer may reheat-treat such lot, but not more than twice. The results of acceptable retests shall conform to the requirements specified in the section on tensile properties.

If the percentage of elongation of any tension test specimen is less than that specified and any part of the fracture is more than ¾ in. from the center of the gage length, a retest shall be allowed.

Workmanship

All castings shall be made in a workmanlike manner and shall conform substantially to the dimensions on drawings furnished by the purchaser or to the dimensions predicated by the pattern supplied by the purchaser.

Finish

The castings shall be free from injurious defects, and shall be satisfactorily cleaned for their intended use when offered for inspection. Minor defects that will not ultimately impair the strength of the castings may, with the consent of the purchaser's inspector, be welded by an approved process.

Marking

The manufacturer's name or identification mark and the pattern number, also the purchaser's identification marks when specified, shall be cast on all castings excepting those of such small size as to make such marking impracticable. In addition, the numbers of the melts used for pouring the castings shall be stamped on all castings individually weighing 300 lb. or more.

Inspection

The manufacturer shall afford the purchaser's inspector, without charge, all reasonable facilities to satisfy him that the material is being furnished in accordance with these specifications.

Rejection

Unless otherwise specified, any rejection based on tests made in accordance with these specifications shall be reported within five working days from the receipt of samples.

Material which shows injurious defects following original inspection and acceptance at the manufacturer's works shall be rejected. The manufacturer shall be notified promptly.

Rehearing

Tested samples representing rejected material shall be held for fourteen days from the days of the test report. In case of dissatisfaction with the results of the tests, the manufacturer may make claim for a rehearing within that time.

NOTE 3. The special test block conveniently used in many steel foundries, frequently called a "keel-block," consists of a slab or plate having a small area and one or more underlying ribs, or coupons, which often are approximately 1 in. thick. Specimens from coupons made uniformly in some such manner afford the only reliable means for making accurate evaluations of steel used for casting comparative manufacture.

NOTE 4. Grade B is used most extensively in making castings for miscellaneous industrial applications, and is easily machined with ordinary machine tools. Grades A-1 and A-2 are produced intentionally with such a low-carbon content as to make the material very soft and machineable with great ease, either in the "as-cast" or in the annealed condition. The carbon content adapts Grades A-1 and A-2 effectively for fusion fabrication with wrought parts of low-carbon steel. Grade H is used for purposes that call for higher strength and less required ductivity than are typical of Grade B, and usually is machined without appreciable difficulty with modern tools.

[1]The term "lot" as used in this paragraph means all castings from each melt in each heat-treatment charge.

Ideas FROM PRACTICAL MEN

Simple Tools for Drawing and Punching

CARL J. SCHMIDT

A simple die set for use where but a few pieces are needed can be made in almost any shop by the following method. The die shown was for blanking, drawing, trimming and punching the cup shown at *D* Fig. 1. Here *A* shows the blank, *B* the cup as drawn, *C* as trimmed and in *D* it has been punched and is ready for use.

The tools and their operation are shown in Figs. 2, 3, 4 and 5. The blank, which is 1-in. in diameter, is cut by punch *A* in Fig. 2, the strip being fed through the slots in the sides of the die *B*. In the next operation, shown in Fig. 3, the punch draws the cup as indicated. The blank is held in the opening in *B*, which is now inverted and drawn by the punch *C* inserted through *B*. Bushing *D* is inserted to control the depth of the cup. This also regulates the amount of flare at the top of the shell. The two parts are held together by the screws shown, the pressure being adjusted to prevent wrinkling.

The cup is trimmed by the stepped punch *F*, Fig. 4. The end of this punch fits inside the cup and the larger diameter fits the hole in *A*. The sharp corner of *F* trims the shell as shown. The final operation—punching—is done as in Fig. 5. Here the bushing *D* is again used in *A*, while a punch *G* is guided in the punch *F*. This punch is 0.002 in. smaller on one end to permit it to enter the cup freely, and this end is used in the punching operation in Fig. 5. The punching is forced through the hole in *D*.

Drilling a Hole Deeper Than the Length of the Drill

O. D. BRADSHAW
Fredericton, New Brunswick, Canada

Referring to the article by Malcolm K. Parkhurst under the title given above (*AM*—Vol. 79, page 330), I do not think that Mr. Parkhurst's idea is very practical from the standpoint

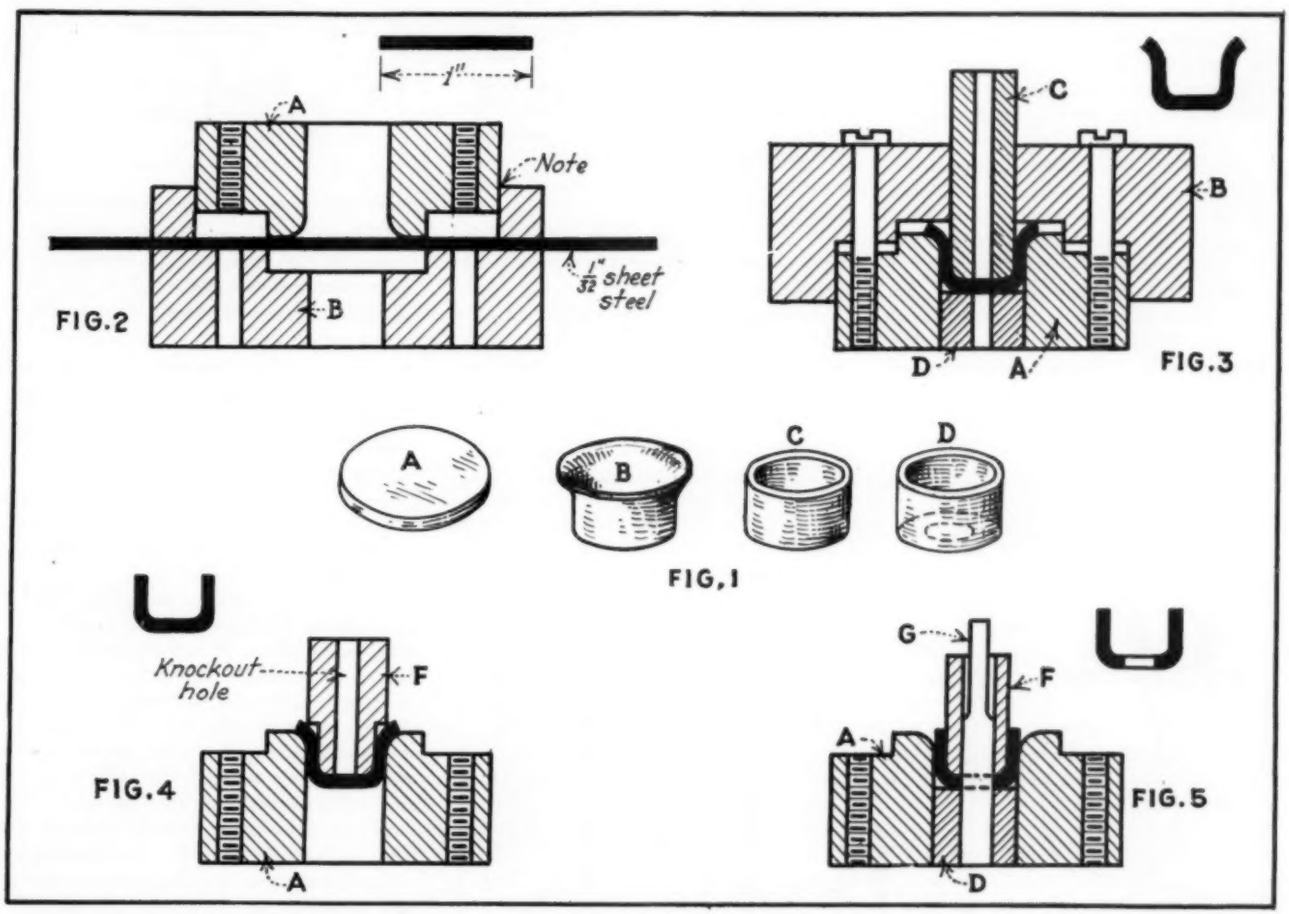


Fig. 1—The blank and the various stages of the drawing, trimming and punching. Fig. 2—Strip stock is fed through slots in the side of the die while the punch cuts out the blank. Fig. 3—Punch and die inverted and screwed together to hold blank against wrinkling. The punch C draws the cup. Fig. 4—Trimming end of cup with stepped punch using punch A inverted. Fig. 5—Final operation of punching hole in bottom of cup using bushings for guides

of economy. Much time would be lost in removing the drill to clean out the chips from the hole, and if this were not done a wedged or a broken drill would result and would be difficult to remove under the conditions stated.

Time would be saved by brazing an extension on the drill with an acetylene torch, the heat of brazing not being great enough to draw the temper of the drill. However, as a precaution, the fluted part of the drill could be covered with wet asbestos while brazing. By using an extension smaller in diameter than that of the drill there would be no danger of its seizing in the hole. If it is necessary to remove the extension at any time, the spelter used in brazing can easily be melted.

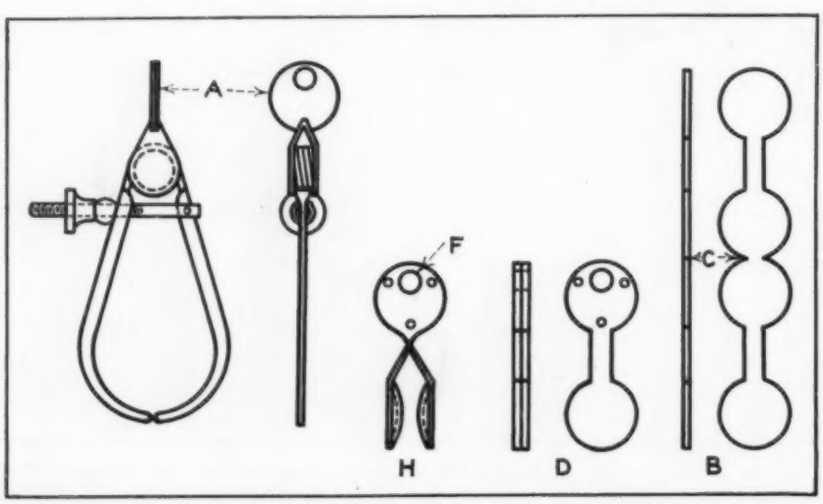
Caliper Attachment

ARTHUR MUNCH

To render my small coil-spring calipers easy to pick up and handle, and to prevent the adjusting nut from being disturbed when the calipers were laid down, I made the attachment shown at *A* in the illustration.

The blank for the attachment was cut from spring brass, as at *B*, and folded at *C*, appearing as at *D*. The upper folds were riveted together and the hole *F* was drilled for hanging up the calipers. The upper and lower parts were then twisted 90 deg., the legs bent and the two lower disks dished, as at *H*, to snap into the hole left by the coils of the spring.

When the calipers were laid down, they rested on the points and on the edge of the disk at the top, preventing the adjusting nut from contacting with whatever the calipers touched, thus preventing disturbance of the adjustment.

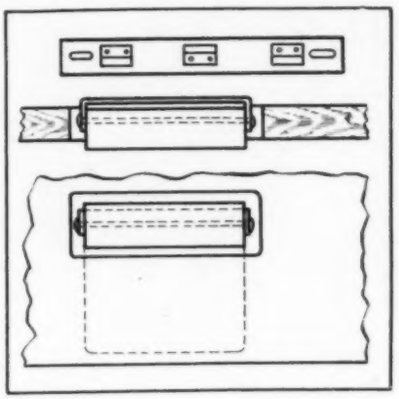


The disk at the top makes the calipers easy to pick up and to handle and prevents the adjusting nut from being disturbed when they are laid down

Keeping Drawings Clean

JOHN A. HONEGGER

Because of the sliding action of the T-square, loose particles of lead from the lines made by the pencil are picked up by the blade and are smeared over



Rollers keep T-square blade clear of the drawing

the drawing, making it difficult to keep the drawing clean while it is being worked on.

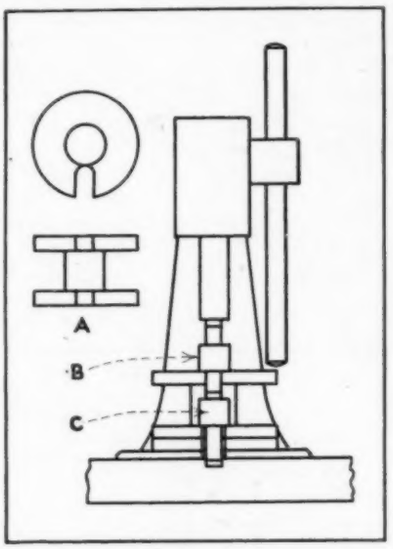
To overcome this condition, I cut slots in the blade of my T-square in three places along its length and mounted on it three brass rollers assembled in spring holders, as shown in the illustration. The holders were riveted to the upper surface of the blade. The rollers projected through the slots and were of such diameter as to raise the blade $\frac{1}{32}$ in. above the drawing.

In use, the T-square is rolled into the desired position, when a slight pressure on the blade by the hand deflects the spring holders enough to permit it to rest directly on the drawing. Since the blade does not touch the drawing when the T-square is moved from one position to another, it does not pick up and carry the loose particles of lead.

Double Table for the Arbor Press

H. MOORE
Hamilton, Ontario, Canada

In the manufacture of bushings on a production basis, two mandrels were required. While one was in the lathe, a finished bushing was removed from



With the work on a mandrel tapered at each end, the finished bushing is loosened and the one to be turned is pressed on at one stroke of the ram

the other one and another bushing was pressed on. The speed of the lathe and the short length to be turned, however, did not leave quite enough time for the operator to check his work properly. To reduce the in-between work, the double table *A* was made for the arbor press. It is really two tables connected by an integral separator.

A mandrel having a double taper was made, the tapers beginning at each end and ending at a point midway of the length. Flats on the mandrel ends engaged a slot in a driving plate, so that no dog was required.

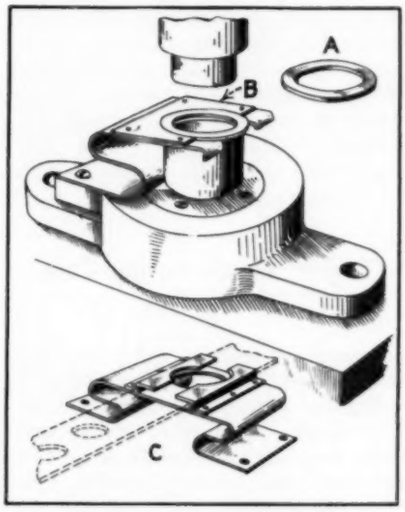
When a bushing has been finish turned, the mandrel on which it is mounted is removed from the lathe, the next bushing to be turned is placed on the unloaded end, and the mandrel is placed in the press, the bushings being in the positions in relation to the double table shown in the illustration. Bringing down the ram simultaneously loosens the finished bushing *B* and presses on the one *C* to be turned.

Easily Made Locating Plate and Stripper

CHARLES H. WILLEY

We have a lot of scrap disks of thin fiber from which we make small gaskets, as at *A*, and find the type of combined locating plate and stripper *B* to be very efficient. It is easily and quickly made from heavy spring brass and is adaptable to the tools for many jobs.

For strip stock, the combined guide and stripper *C* can be used.



Combined locating plates and strippers of spring brass can be made quickly and cheaply. Where strip stock is used, the combined guide and stripper C is very efficient

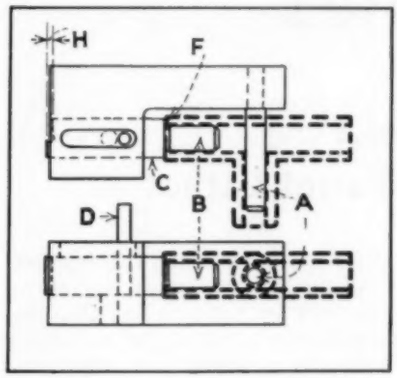
Gaging From a Crosshole

FRANK HARTLEY

A gage is shown for gaging the distance between the end of the T-shaped piece, indicated by heavy dotted lines, and the center of a crosshole.

The work is located by the fixed pin *A* engaging the crosshole. The pin *B* on the sliding gage *C* is entered into the horizontal hole by sliding it by the pin *D* until it is arrested by the shoulder *F* contacting the end of the work. Whether or not the distance between the end of the work and the center of the crosshole is within the required limits is indicated by the outer end of the sliding gage, which forms a flush pin, the limits *H* being ground thereon.

It should be noted that the diameters of both holes have previously been checked by a plus and minus plug gage, and that the alignment of the holes has also been checked, so that the diameters of both the locating pin and the pin on the sliding gage are small enough to enter their respective holes under the greatest permissible variations in diameter.



The work is located by a fixed pin engaging the crosshole and is gaged by the shoulder of a pin on a sliding block. The outer end of the sliding block forms a flush pin

SEEN and HEARD

John R. Godfrey

Consultants vs. Cornshellers

Lack of appreciation of the details that go to make up any article of manufacture leads to much misunderstanding and disappointment. Seeing such articles as propelling pencils sold at unbelievably low prices some get the idea that they must be made in a special machine that takes raw material in at one end and grinds it out at the other like a cornsheller. And in some cases they have an urge to buy machines of this kind and go into the business with no idea as to the many operations and costs that lie behind the finished product. Then, too, there is the idea afloat that special machines are available for all sorts of operations without realizing that the limited demand for such machines would not keep even a small shop alive.

If those without mechanical background would spend a few dollars in consulting men who know manufacturing, they would save both time and money. Instead of wasting time hunting for machines of the cornsheller type to turn out a complete product they would analyze the operations necessary to produce it and suggest the most economical machines. Modern press work practice makes many products possible at astonishingly low costs without the magic of special machines.

Engineers and production men should be consulted much more frequently than they are in matters of this kind. They can save prospective manufacturers many times their consultation fee.

Danger from Rust

Rust-resisting material should be used for all fastenings in places where corrosion is abnormal. This includes not only marine service but all places where moisture gathers. Bolts and similar fasteners are frequently eaten through in much shorter time than seems possible. Where such bolts hold heavy machinery, their failure is a constant source of danger.

Taper Fits in Railway Work

Press fits of wheels and axles in railroad work are usually supposed to be straight. But at least one big road turns the wheel fit of the axles a slight taper. This taper varies from 0.003 to 0.008 in. per foot. The smaller taper is used where the wheel hubs are heavy as in trailer wheels. The slight taper is believed to secure better contact along the whole length of the fit and put less stress on the hubs.

Another use of taper is in the brass pins used in some cases to prevent end motion of crown brasses in the driving box, should the constant pounding loosen the press fit as the brass wears. These pins are 1 in. in diameter and taper $\frac{1}{8}$ in. per foot. They are driven from the bearing side of the crown brass and are riveted over where the small end comes through the top of the driving box.

Designing for Next Year

Designing with an eye to the future is always to be commended, regardless of objections that may be raised to planning in general. This kind of designing, however, is usually confined to possible improvements in performance as a result of later inventions or discoveries. But I recently saw a case where planning took another angle. This was a machine with the usual cast base or frame, but so designed that a change to welded steel construction would not change the general appearance of the machine enough to be noticeable. When, in the maker's opinion, a welded steel construction becomes more desirable, the new machine will closely resemble the old.

Shop Equipment NEWS

Gisholt Ram-Type High-Production Turret Lathes

Efficient for high-production work and also for small-lot jobbing, the ram-type turret lathes introduced by the Gisholt Machine Co., Madison, Wis., are easy to operate. Their fast manipulation is partly due to the automatic labor-saving devices built-in as standard equipment. The three machines are identical in design and construction, differing only in size and capacity. They cover 1½ to 2½-in. bar capacity and 8- to 15-in. chucking capacity.

The hexagon turret and its stop roll are automatically indexed to the next position with the back movement of the ram slide. As the ram slide goes forward to the work, the hexagon turret is automatically located and clamped in place. The operator need not take his hands from the pilot wheel to accomplish this whole operation. Four tools are taken in the quick-indexing square turret on the cross-slide. Here again a single lever movement accomplishes the indexing, locating and clamping. A forward and back movement of the lever is all that is required to index the toolpost preparatory for the next operation.

A change in spindle speed can be secured without passing through intermediate speeds by the use of the selective gear transmission. Three levers control the twelve speeds available. One lever splits the twelve speeds into two groups of six speeds, one high and one low. A second lever splits the group being used into two further groups of three speeds each. The third lever selects from this group the particular speed desired. The shift from high to low speed as from drilling to reaming or from turning to threading is made through multiple-disk clutches and is done without stopping the spindle. A single lever controls shifting from forward to reverse. When the lever is in the neutral position, a brake is applied automatically to stop the spindle. Moreover, a safety latch in neutral position prevents accidental starting.

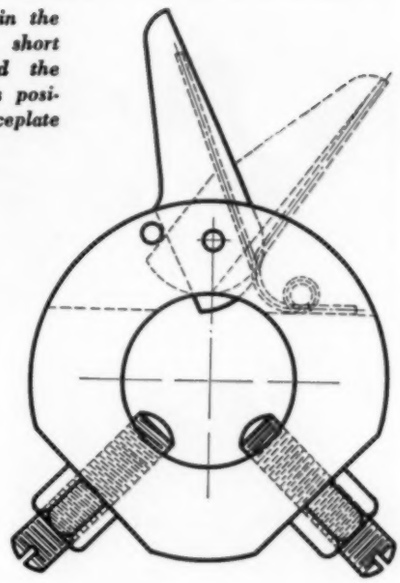
In each Gisholt turret lathe lubrication is assured by automatic devices. The headstock is automatically oiled by a splash system, while the tapered roller spindle bearings are oiled with filtered lubricant from a catch reservoir. The aprons are automatically oiled by a forced-feed system. Hand pumps at the ends of the apron are utilized for lubricating the ways. The whole oiling system is designed to save the operator's time.

"Ready" Quick-Acting-Cam Grinder Dog

In order to facilitate quick handling of short pieces of work, the quick-acting-cam grinder dog, announced by The Ready Tool Co., Bridgeport, Conn., has only one moving part. The cam and extension are hinged so that when the operator holds the dog the pressure of his thumb on the cam ex-

Automatic indexing of the hexagon turret and its stop roll, single lever movement for indexing, locating and clamping of the square turret, and a selective gear transmission for spindle speeds all combine to save the operator's time

Thumb pressure holds the cam in the released position for inserting short pieces of work; when released the cam snaps onto the work and is positively held by a pin on the faceplate



tension withdraws the cam and allows work to be placed in position quickly. Upon releasing the pressure, the spring forces the cam down against the work. Additional pressure is maintained by the driving pin in the faceplate striking and pushing forward the cam extension so that there is no possibility of slipping.

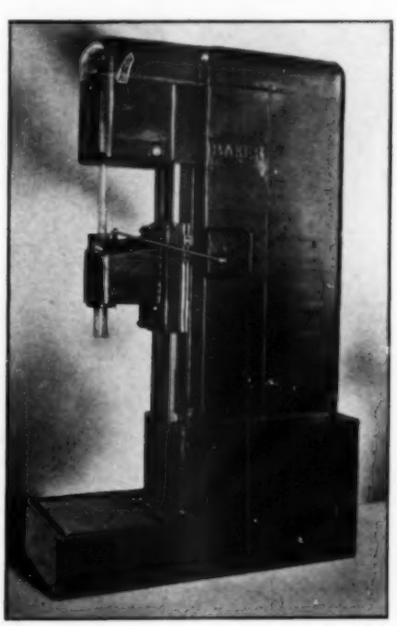
There are two adjusting screws to compensate for various sizes of work. These are quickly adjusted with a screwdriver and locked with a check nut. These dogs are made in four capacities: ¼ to ¾ in., ¾ to 1⅛ in., 1⅛ to 1½ in., and 1½ to 2½ in.

Baker "Clean-Line" Drilling Machines

Flexibility for quick change-overs, simplified design and modern appearance, are found in the "Clean-Line" heavy-duty, hydraulic-feed drilling machines announced by Baker Brothers Inc., Toledo, Ohio. These hydraulic machines are for drilling, boring and forming, and the working parts are fully inclosed to give maximum protection. Three sizes are built of which the 10-HO ilustrated is the smallest. It is rated at 1¼ in. in SAE 1035 steel.

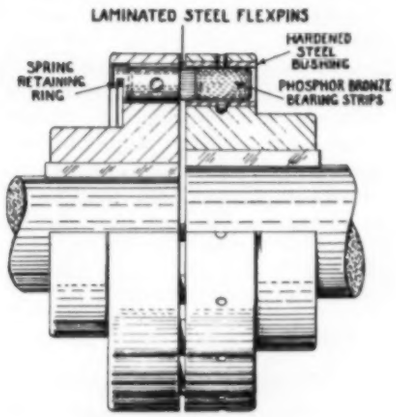
The machine can be built as a manufacturing type with a simplified speed drive incorporating pick-off gears for change of speed, or can be furnished with a sliding gear transmission in the main speed drive to the spindle, so as to give quick changes of speed. Driving motors and electrical control are inclosed in the rear guard which is readily removed for service to electrical equipment. Multi V-belt drive is used from the main drive motor which is mounted vertically to the rear driving shaft in the upper speed box. The Oilgear pump and controls are inclosed in the base together with the oil pump. In this design, a minimum amount of piping is required.

Full hydraulic feed is used and all feed reactions are taken to the base and foundation. Thus, the head and tool-carrying spindles are pulled directly down to the work without springing away from the cut. The long saddle carries the heads and is arranged with a taper take-up gib in the center and with two tightening gibs. Multiple heads are mounted to brackets on the saddle. This mounting allows for interchangeability. All heads are ball-bearing construction with alloy steel gearing, and provision in spindle ends for vertical adjustment to maintain relation of length of tools. These machines can be furnished with plain or index tables, and these can be had in different diameters and numbers of indexes to suit the work handled.



Flexpin Couplings

Increased power capacity, longer life and greater protection for the connected machines against shaft misalignments, shocks and vibrations are said to be the advantages of the Flexpin couplings, announced by Smith & Serrell, 30 Washington Place, Newark, N. J. The couplings consist of steel laminations, copper coated to resist rust, held in a slotted keeper by hardened steel crosspins which are welded in place. Sliding ends of the flexpins have thick phosphor-bronze bearing strips welded to the outside spring laminations. The Flexpins are held in place in one flange by a spring re-



taining ring, or by radial bolts in the larger sizes. Hardened steel bushings, with rectangular broached holes to receive the long sliding ends, are employed in the other flange and are locked in place so that they may be easily renewed.

Load pressure between the bronze bearing strips and the sides of the broached bushings are thus separated from the pressure due to centrifugal force, as the laminated springs contact with the upper, inside surface of the bushings, as well as with the sides of the bushings.

Norma-Hoffmann Cartridge-Type Ball Bearing

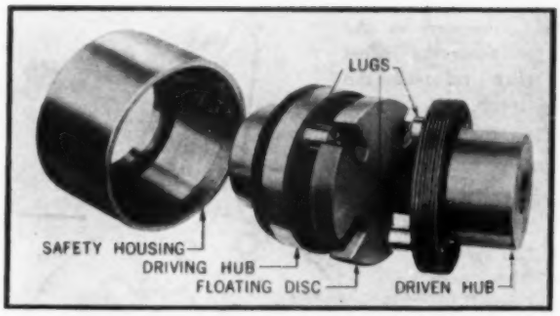
The Norma-Hoffmann Bearings Corp., Stamford, Conn., announces an addition to its line of self-protected precision bearings, in the form of a completely inclosed cartridge type, single-row unit, designated as the "3000" series.

The "3000" series, although having but one row of balls, has inner and outer rings of standard double-row width. The metal sealing plates are easily removable for inspecting or cleaning the bearings.

"Lifetyme" Flexible Coupling

A self-aligning coupling for direct-connected drives has been developed by the Alloy Products Corp., Waukesha, Wis. The coupling is self-adjusting to compensate for parallel misalignment as well as angular misalignment. Tests show that the coupling will run under the following conditions: $\frac{1}{8}$ in. parallel misalignment and from 3 to 6 deg. angular misalignment. One such coupling is being used on a 10-hp. drive operating at 5,000 r.p.m.

The coupling consists of four parts. Two of them are driving hubs into whose faces two round lugs are set, two per hub. When assembled the lugs fit into recesses in the periphery of the third part, a drive disk made of bone fiber. These recesses are made long to permit the lugs to slide in them which is the self-adjusting feature. Although the coupling will operate satisfactorily at any degree of misalignment within the above limits, the centrifugal action tends to make it self-aligning as the bone fiber disk has a tendency to float, thereby finding its own center. The fourth part is a cover housing which acts as a guard.

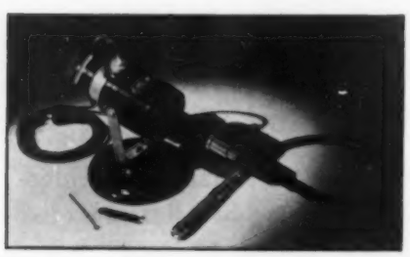


Self-adjustment to parallel and angular misalignment is secured in this coupling by allowing the lugs on the two hubs to adjust themselves in the long recesses of the floating disk

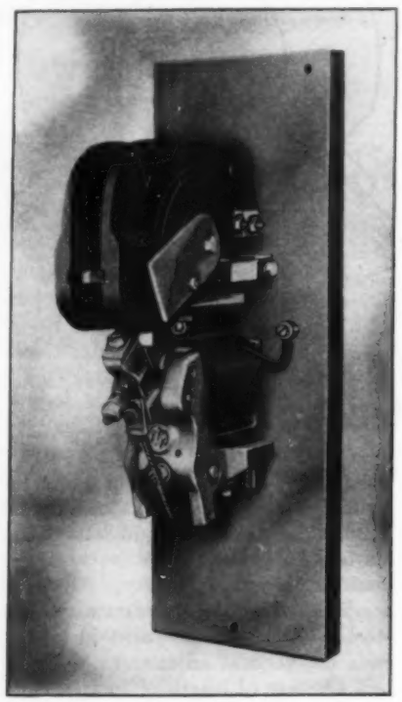
Dumore KG Vari-Speed Flexible-Shaft Tool

This flexible shaft tool was brought out by the Dumore Co., Racine, Wis., to fill the needs of operators who must have a tool for finishing up dies, working out delicate lines and parts of metal as well as wood patterns. The shaft can be run while bent in a U-shape, permitting the operator to work in "hard to get at" places.

On higher speeds, the rotary files cut



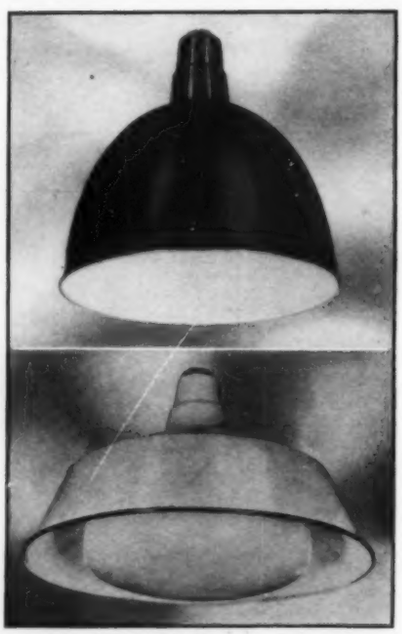
wood and softer metals, while on lower speeds the files may be used on iron, steel and the harder alloys. An improvement in this tool is the speed control by means of an electric governor, and not a rheostat. The flexible shaft is 43 in. in length, and the hand piece is of ball-bearing construction. The chuck has a $\frac{1}{4}$-in. capacity and is of the collet type. A bail is furnished for hanging the tool from a trolley or hook.



"Line-Arc" Magnetic Contactors

For use on mill, crane machinery controllers and other d.c. applications, the Electric Controller & Mfg. Co., 2698 E. 79th St., Cleveland, Ohio, announce a complete line of magnetic contactors up to and including 800-amp. capacity. In these contactors, the arc, formed as a circuit is opened, ruptures harmlessly in a narrow path or line centered between, but not touching, the arc shields.

"Line-Arc" contactors are made of an aluminum alloy with magnetic parts of rolled steel and have the advantage of light weight and low inertia of moving parts, permitting quick response and high speed operation. Operating coils are designed for continuous operation on d.c. circuits of 230 volts or less.



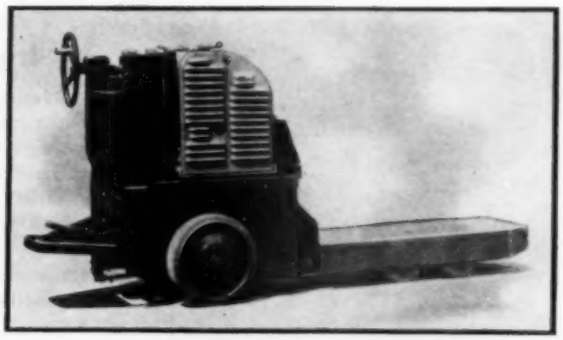
Mercury-lamp high-intensity lighting of high and low bays is the function of these two reflectors

Westinghouse Mercury Lamp Mountings

For industrial lighting using the new 400-watt high intensity mercury lamp, several lighting fixtures are announced by Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa. These high, medium and low mounting reflectors of aluminum are suitable for mounting heights of 18 ft. or more; the new one-piece Glassteel Diffuser is designed for mounting heights of less than 18 ft.

High mounting reflectors are made from commercially pure "etching grade" aluminum sheet. The Mogul type skeleton socket with high-heat wax and nickel-plated interior is held in place by a cast-brass adapter which is locked to the reflector by means of a special cast aluminum cap.

Westinghouse 24-in. high intensity Glassteel Diffusers are drawn from Armco iron and are finished with one ground coat and two white coats of porcelain enamel, inside and outside. This reflector uses the same socket and holding construction as the aluminum reflectors.



Loads of 5 tons can be carried by this hydraulic low-lift platform truck. Battery space is provided but a gas-electric unit gives continuous operation

Mercury Heavy Duty Trucks

Although the low-lift industrial truck designed by the Mercury Manufacturing Co., 4100 South Halsted St., Chicago, Ill., is built as standard with a compartment to accommodate necessary cells for storage battery operation, the truck is equipped with a gas electric unit for continuous operation. It has a capacity of 10,000 lb., and platform elevation is accomplished by a hydraulically operated link mechanism.

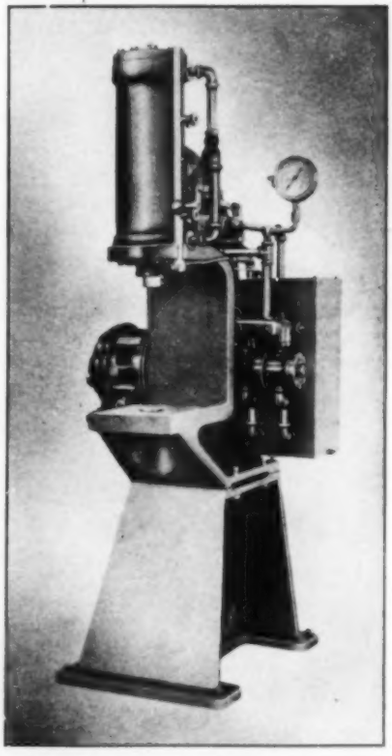
Other features of this industrial transportation unit are the tandem trail axle employing four wheels, the location of the brakes in the drive wheels, magnetic contactor control of travel and hoist, positive, automatic overload protection and wheel type steer, which may be either horizontally or vertically disposed.

"Greenerd" Hydraulic Forcing, Broaching and Molding Press

Versatile in its application, the No. 60 hydraulic arbor press, announced by the Greenerd Arbor Press Co., Nashua, N. H., is particularly adaptable for assembly work, push or pull broaching, keyway cutting and light plastic molding. Pressures obtainable are from ½ to 15 tons on the down stroke and from ½ to 13 tons on the up stroke.

A combination low and high pressure pump is driven by a 3-hp. motor mounted on the side of the frame with the tank mounted at the rear of the press. The control valve is either foot or hand operated. Automatic or manual reverse can be made at any point in either direction. A stop rod also regulates the length of travel in either direction. When the ram is at top position the pump bypasses, relieving all pressure.

Ram travels at the rate of 96 in. per min. under 6 tons pressure, and 36 in. per min. under 15 tons pressure. Height over table is 16 in., and the press receives diameters up to 18 in.



Versatile control adapts this press to a variety of operations

Federal Model 110 Comparator

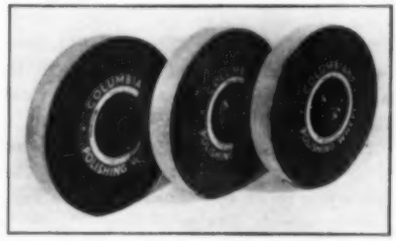
The Model 95 clear vision indicator, recently announced by the Federal Products Corp., 1144 Eddy St., Providence, R. I., is used on the company's Model 110 clear vision dial comparator. This instrument measures a half of 1/10,000 of an inch. It is of rigid construction as is necessary in a precision instrument of this character. The indicator is raised and lowered by means of the right-hand knob. Indicator is clamped in position by means of the left-hand knob.

Lower anvil is raised and lowered by means of a large diameter ring which bears upon ball bearings. A 24-pitch thread gives the micrometer adjustment to the anvil. Although the anvil illustrated is standard, other special types can be furnished.

Columbian Fiber Polishing Wheel

Advocated for use in connection with Aloxite Brand TP and Carborundum polishing grain for all classes of metal finishing, the Columbian fiber polishing wheel introduced by the Carborundum Co., Niagara Falls, N. Y., is produced by combining vegetable fiber with a tough, resilient bonding agent. As a result, the wheel is said to have an even density and texture.

Columbian polishing wheels are made in three densities: soft, medium and hard. Water, oil or grease have no deteriorating effect on the material forming the wheel structure. To remove the old abrasive head, the wheel is washed in warm water or steamed



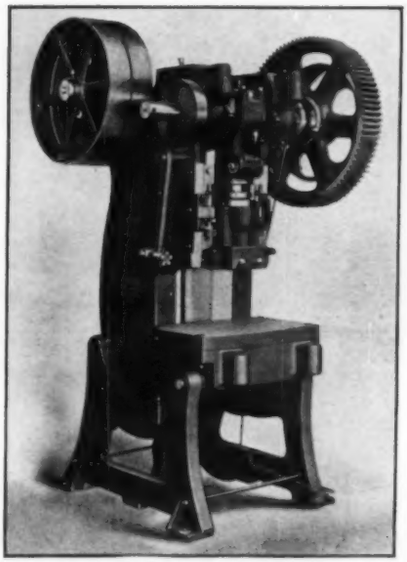
without causing change in wheel diameter or distortion of wheel face. It can be dressed with dry pumice or an abrasive stick. These wheels can be furnished with special wheel faces as may be required for polishing and finishing of formed parts.

Another feature of the Columbian wheel is the metal hub. This accurately machined hub is built into the wheel and centered. It eliminates excessive wear or scoring.

Rockford No. 5—½R Inclinable Punch Press

Improvements incorporated in the No. 5—½R inclinable open-back punch press announced by the Rockford Iron Works, Rockford, Ill., include a locking device consisting of a split plug and draw bolt to lock the adjusting screw to the connecting rod. This does away with the familiar saw slot which allowed the connecting rod to be squeezed on the adjusting screw and was the major cause of connecting rod breakage. An alloy crankshaft is used, having both the brake collar and clutch collar forged in one piece.

The press has a capacity of 56 tons. The flywheel press weighs 7,700 lb. while the single-geared press weighs 8,950 lb.



Hanson-Van Winkle-Munning Anode Filter Bags

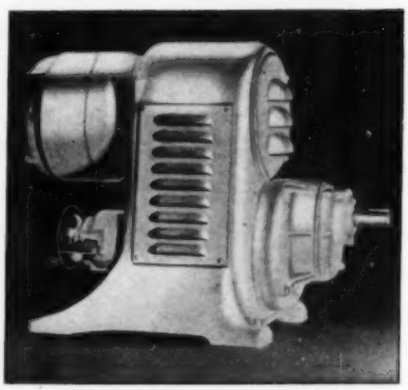
Filter bags for anodes, recently developed by the Hanson-Van Winkle-Munning Co., Matawan, N. J., consist of two cloth bags, one fitting inside of the other, with a layer of filter paper between.

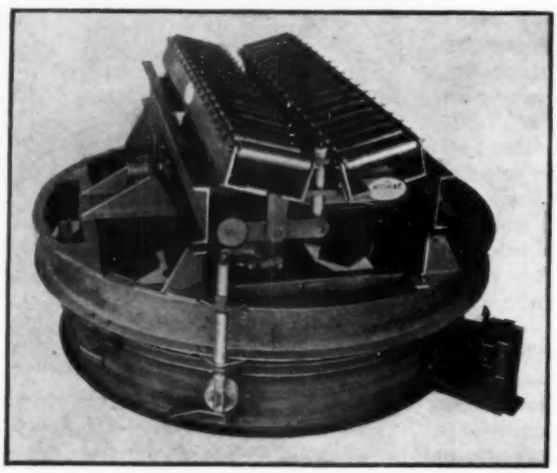
In use, the anode is placed in the filter bag, then suspended in the plating tank in the usual manner. Sludge, which may cause rough and pitted deposits, remains in the bag. When the anode has been used up, the filter bag is discarded.

Mathews Power Turntable

A Westinghouse-equipped, electrically operated, 7-ft. diameter turntable, suitable for revolving 6-ton coils of strip steel prior to pickling, is announced by the Mathews Conveyor Co., Ellwood City, Pa. The unit is driven by a 5-hp., 1,200-r.p.m., 3-phase, 60-cycle, 220-volt motor coupled to a vertical speed reducer and spur gears. Its purpose is to receive from a straight line of conveyors 12,000-lb. coils of strip steel, which are placed on the conveyor from coil storage at random. The turntable serves to place the coils of steel with their loose ends in the proper position to enter the continuous pickler.

Coils being conveyed on their side, core axis horizontal, a troughed section of heavy duty conveyor is used to handle this circular shape. Individual rollers in the conveyor section are ball bearing mounted, grease packed and fitted with grease fittings for periodical lubrication. The rollers are 3⅝ in. in diameter, each having a continuous load rating of 2,000 lb.





Coils of strip stock weighing 12,000 lb. are taken from the conveyor and positioned by this turntable so that the loose ends can enter the continuous pickling machine

Jessop Mogul High-Speed Steel

The Jessop Steel Co., Washington, Pa., has announced that, under a license agreement with the Cleveland Twist Drill Co., Cleveland, O., holder of a patent covering "Mo-Max" molybdenum high speed steel, it is producing the same type of steel under the trade name of "Mogul." This steel entails the use of only a small quantity of tungsten and of relatively high amounts of molybdenum.

Chicago No. 220 Wide-Vision Goggle

The super-safety lens, used in the "Cesco" Style No. 220 wide-vision goggle, announced by the Chicago Eye Shield Co., 2298 Warren Blvd., Chicago, Ill., does not change direction of light rays passing through the lens. The shape of the eye cups allow natural, full and wide vision. The goggles are close fitting and edges contacting the face have a gum cushion binding. The large curved lenses are interchangeable by means of a simple hinged door. Curvatures are such that the lens is entirely free from focus and the optical center is located so that the line of sight for an eye looking straight ahead suffers no deviation.

U. S. Varidrive in Upright Design

U. S. Electrical Mfg. Co., 1505 South Western Ave., Chicago, Ill., has announced that its "Varidrive" unit is now being offered in an upright design. Advantage of the upright unit over the commonly used horizontal design is a saving in lateral space. This design also gives the user the option of having the take-off shaft at either the high or low position.

Phillips Recessed Screws and Bolts

Greater strength of the head, an important feature of the Phillips machine screw and bolts, introduced by the American Screw Co., Providence, R. I., makes it possible to set them up tighter without danger of breaking the head. A tapered recess, which exactly fits the taper driver, takes the place of the slot in the conventional screw. Screws hold on to the point of the driver, and may be brought into position with one hand, a feature of particular importance when driving in "hard to get at" places.

The self-centering feature prevents the driver from slipping sideways and all the effort required to hold the conventional driver in the slotted screw or bolt can be used as a turning, driving force. There is no danger of the driver slipping out of the slot and marring finished surfaces or injuring the hands.

Only four sizes of Phillips drivers or bits are necessary to drive the entire range of screw and bolt sizes, and two sizes of drivers fit the common sizes of screws in use.

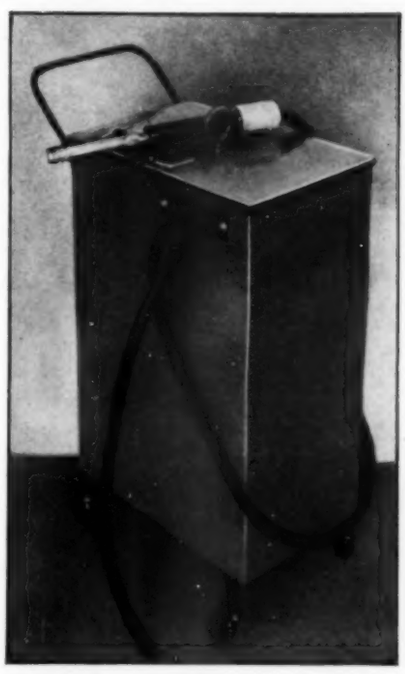
A tapered fluted screw driver bit fits these screws, drives then tighter, does not slip off and mar the finish

Westinghouse 30-150 Amp. Stabilized Arc Welder

Recommended for both production work and for use in repair shops, the 30-150-ampere a.c. welder, announced by Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., is of the reactance stabilized type. The reactor designed to stabilize the machine over the entire welding range, is built into the unit.

Three major steps of current adjustment are obtained from taps on the reactor. Five steps of fine adjustment are obtained from intermediate taps between each major step. Adjustment is made by means of convenient plug and receptacles. This method of current adjustment permits operating over the entire range with constant open circuit voltage, which gives the most favorable conditions for a.c. welding.

This welder is available for primary voltages of 110-220 or 220-240 volts. The outfit weighs 230 lb.



U. S. Royal Cord Flat Belt

The most striking characteristic of the U. S. Royal Cord flat belt, introduced by United States Rubber Products, Inc., 1790 Broadway, New York, N. Y., is the square cut edge. Due to the cords being imbedded in rubber, the cut edge can be run against shifters.

Laminated and cut edge construction permit the use of a single ply of duck on each side instead of several plies in the envelope type. Since the efficiency of ply of cord fabric in the carcass is much greater than that of a duck ply in the cover, it will be realized what an advantage in strength is gained when such substitutions are available in the same number of plies.

A special duck, requiring but one cover joint, has been developed to eliminate the disadvantage of the many seams in the bias-cut duck cover. The belt is available in widths up to 24 in. and in plies from five up.

Elwell-Parker Elevator Trucks

Improvements incorporated in the Type ELN-6 elevator trucks, announced by the Elwell-Parker Elec. Co., Cleveland, Ohio, begin with increased sturdiness of construction. The frame is built of extra large commercial shapes, securely reinforced with heavy angles and gusset plates, either welded or riveted. In this model chains replace cable for hoisting.

With telescoping uprights the platform elevates 62½ in. before inner uprights begin to rise. Loaded skids may be raised to a height of 10 ft. Maximum lift heights depend upon the height of the upright. Automatic cut-out switches are provided to stop platform at both upper and lower limits of travel. The truck is 41 in. wide and 128 in. long with a 27x54-in. platform. Height of platform in low position is 11 in.

Extra large structural shapes, heavily reinforced, and a chain drive fit this truck to elevate heavy loads to a height of 10 ft. Platform measures 27x54 in. and its height lowered is 11 in.

Taylor "Valv-Precisor"

It is claimed that any air-operated controller, with the aid of the "Valv-Precisor," announced by the Taylor Instrument Companies, Rochester, N. Y., can position the valve disk 50 times more accurately when opposed by valve stem friction and diaphragm motor hysteresis than when the device is not used. The instrument is recommended on all processes which have time lags or heat capacity commanding a low or minimum controller sensitivity, provided that load changes are negligible or infrequent. It should not be used on processes involving large time lags and load changes. For such applications the Taylor "Dubl-Response" control system is recommended.

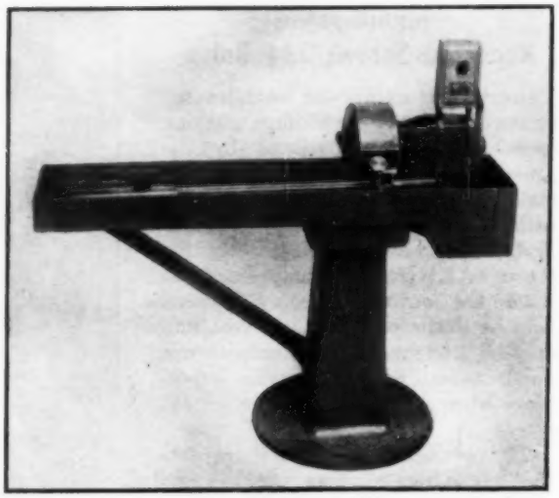
The Valv-Precisor is a compact unit which can be mounted on any diaphragm valve, to be used in conjunction with any air-operated controller. Case dimensions are 8x5x2 in. It must be so located on the diaphragm valve that a rigid connection is always maintained with the valve stem. A 25-lb. per sq.in. air or gas supply is recommended for most efficient operation.

Gillord Metal Spray Equipment

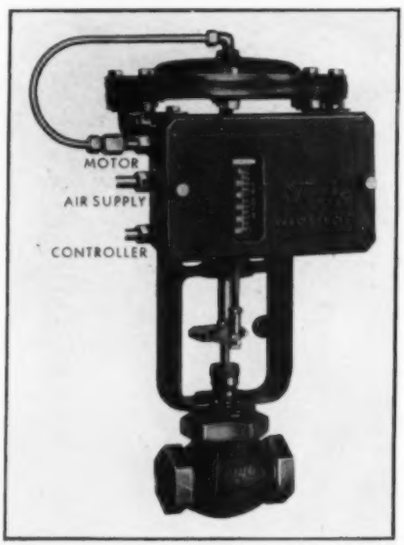
Designed for securing a hard, and often stainless, coating of high grade metal upon other metal objects of cheaper stock, and for securing a hard metal to replace that worn off in use on shafts and similar parts, the Gillord metal spray, announced by the Gillord Sales Corporation, 420 Lexington Ave., New York, N. Y., is capable of handling 12 to 15 lb. of steel or steel alloys per hour, and a correspondingly greater amount of other metals, depending on their melting points.

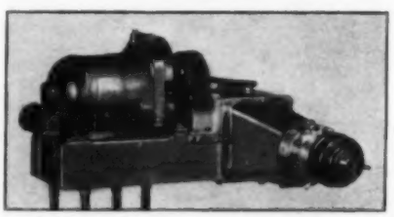
All the gases and air are handled through metering jets, and when once set by the factory do not require further adjusting. Operator has control of the wire feed through an adjustable feeding device driven by a constant-speed motor, so that once set in any position the wire is fed accurately.

Metal, which is supplied in the form of standard gage No. 9 wire, is melted in a small melting chamber within the head of the tool, and is insulated by neutralized air, eliminating contact with atmospheric conditions during the time it is being melted, carried to and deposited on the metal. A safety shut-off valve, operated by a single lever, closes all gas and air valves simultaneously in case of emergency. This unit weighs approximately 90 lb.

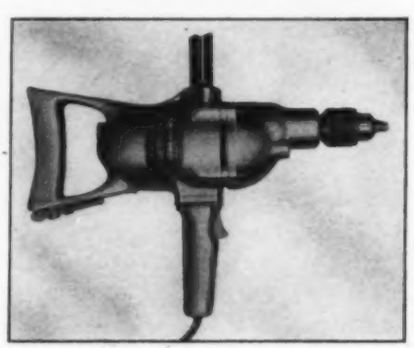


Burning of material is prevented by performing the cutting operation under water. Wheel speed is slower; wheel life prolonged. A smooth cut can be produced on a wide range of materials





For building up worn journals the Gillord metal spray gun can be mounted on the lathe toolpost



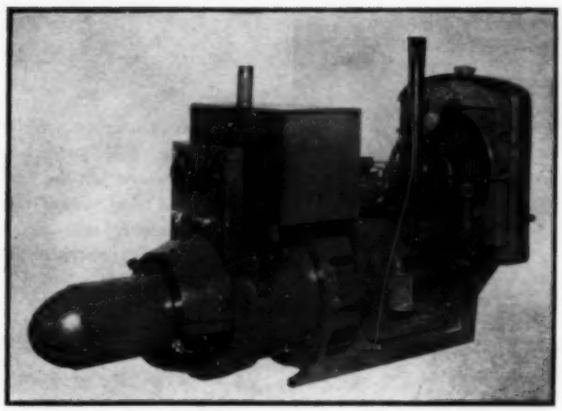
Eisler Cut-Off Machine

Designed for cutting through various shaped bars, rods or tubes of metals, hard glass or ceramics, the wet abrasive cut-off machine introduced by the Eisler Engineering Co., 769 S. 13th Street, Newark, N. J., will take pieces up to 2½ in. in diameter. Cutting is accomplished by means of a thin abrasive wheel driven by a ¾-hp. motor at a speed of 5,500 surface ft. per min. The wheel revolves within a cooling tank filled with water above the cutting level. An adjustable stop is furnished for determining the correct cutting length. A quick-acting clamp and a long trough facilitate holding and handling the material.

In cutting a rod, it is first brought against the stop which locates it for cutting length. The clamping jaw is then closed about the rod, holding it securely as it is brought against the revolving cutting wheel under water. It is immediately severed, whereupon another section is moved into position.

Black & Decker ½-In. "Junior Drill"

Designed to meet a wide-spread demand for a versatile tool adaptable to many drilling and cutting applications, the ½-in. "Junior Drill," announced by the Black & Decker Mfg. Co., Towson, Md., is powered for drilling holes in steel up to ½ in. Standard voltage is 110 volts, but the drill will also be supplied for 32, 220 or 250 volts, without additional charge. Features of this unit include Compo oil-less bearings, safety switch, 3-jaw chuck and key, spade handle and auxiliary pipe handle. Net weight is 10½ lb.



Left—A 23-hp. engine drives this welder which has a current range of 60-250 amp., suitable for bare and coated electrodes up to ¼ in.

Below—Maximum tensile strength and wear resistance depend on moisture content of the cloth. The Udylite buff is humidified at the factory, packed in moisture-proof paper to reach the purchaser in prime condition

Lincoln 200-Amp. Engine Driven Welder

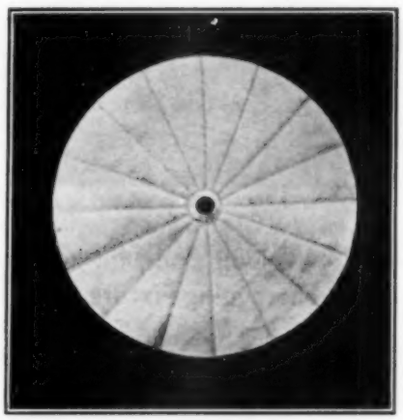
Known as the 200 Amp. "Shield Arc Special," this engine-driven welder, announced by the Lincoln Electric Co., Cleveland, Ohio, supplies a uniform current for welding with bare or heavily coated shielded-arc type electrodes in all sizes up to ¼ in. The welding current range of this machine is from 60 to 250 amp. Generator is the single-operator, variable-voltage type with completely laminated magnetic circuit, equipped with interpoles. Unit requires no external reactance or stabilizer.

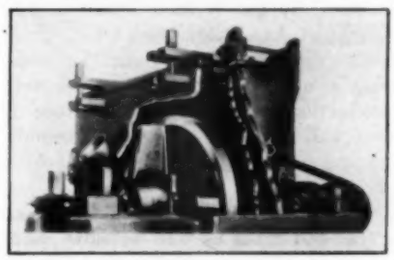
Lincoln dual control of welding current is provided by adjustment of both series and shunt fields. The welder is powered by a Waukesha 4-cylinder engine which delivers 23 hp. at 1,400 r.p.m., the speed at which the welder is operated. A gear-driven governor maintains proper engine speed at all load conditions. Gasoline tank of ample capacity for a full day's operation is mounted over the generator.

General Radio "Strobotac"

A stroboscope for speed measurement, the "Strobotac," announced by the General Radio Co., 30 State St., Cambridge, Mass., measures speed by adjusting the flash rate until the rotating object appears stationary; the flash rate is then read off of a scale which may be calibrated directly in r.p.m.

The Type 631-A Strobotac is small and light and all parts are contained in a single case. The instrument has a flashing rate extending from 600 to 12,000 flashes per min. Weight is 12 lb.; dimensions are 6½ in. x 9 in. x 10 in. The Strobotac operates from 115-volt, 60-cycle circuits.





A spinning wheel propels abrasive in the Pangborn "Rotoblast"

Udylite Humidified Buffing Wheels

Distinctive among the features of the buffing and polishing wheels announced by the Udylite Co., Detroit, Mich., is the special pretreatment given to the cloth before making it up into buff sections. This pretreatment is the Udylite Humidifying Process which introduces proper moisture content into the fibers of the cloth to give it maximum tensile strength and wear-resisting qualities.

When allowed to dry or become deficient in moisture content, cloth is weakened and less likely to resist wear as well as cloth in perfect condition. To further insure the arrival of properly conditioned buffs at customer's plant, the buffs are sealed in moisture-proof paper. These units are available in all sizes, types and styles of sewing, made to specification.

Pangborn "Rotoblast"

Eliminating the need for compressed air as the abrasive driving agent, the Rotoblast, announced by the Pangborn Corporation, Hagerstown, Md., employes a rapidly spinning wheel to propel the abrasive by controlled centrifugal force. The Rotoblast cleans gray iron, steel, alloy and malleable castings, forgings, steel products including pipes, billets, bars, strips, blooms, shapes and heat-treated parts. It is also recommended for preparing properly cleaned surfaces for metallizing, sherardizing, galvanizing, and all types of plating.

The rotor is a balanced, heavy steel casting supported by a flanged shaft. Face of the rotor is recessed and provided with removable steel filled pieces whose adjacent edges form dove-tailed grooves into which the abrasive vanes are inserted. Abrasive enters through a streamlined funnel and is picked up by a small auxiliary impeller inside of the casing and is distributed in equal amount to the vanes. The casing is angularly adjustable for changing, within certain limits, the direction of the abrasive stream. Unit is driven by a 15 hp., totally inclosed motor through a multiple V-belt drive.

Loads of castings weighting 1,800 lb. have been found thoroughly clean after 8 min. of blasting. Loads of gray iron, malleable and steel castings, forgings, stampings and heat-treated parts up to 18 cu.ft. have been cleaned in from 8 to 15 min. All parts exposed to blast action are of abrasion-resisting material.

Columbo Power Hack Saw

The Columbo Machine Co., 114 Liberty St., New York, N. Y., announces the exclusive representation of the line of Columbo hydraulic feed metal hack sawing machines, built in five sizes, from 8x8 in., to 16x16 in., inclusive. The saw frame is heavily ribbed to prevent distortion and runs in a dustproof, angular slide, closely fitted and having a simplified accurate adjustment. Blades are held in the center for a straight line pull, thus avoiding the tendency to twist during the cut. Feed pressure is by means of a hydraulic pump, controlled by valve and indicator lever. A pressure indicating dial shows the cut pressure at all times, so that the operator has a visual guide for feed pressure.

The blade cuts on the pull stroke, and the saw frame is automatically lifted for the return stroke. After the cut is completed, the saw frame returns automatically to the starting position and the machine stops.

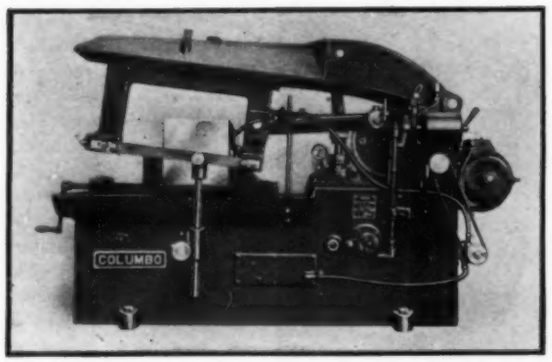
Two stroke speeds are available on each size machine, secured through double gearing. On the belt drive machine, the drive is through a single pulley and on motor drive machines, through direct gear connection with the motor mounted to the rear of the bed frame. Machines are furnished to standard specifications with extras such as plain type and double axle type stock rests, standard or fine adjustment type stock cut-off length stops, saw blades and bundling device.

Cromodizing

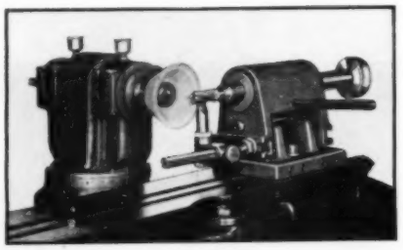
Rustproofing at low cost is claimed for "Cromodizing," a process recently announced by the American Chemical Paint Co., Ambler, Pa. Chromodizing is adapted to protect any type of steel surface regardless of size, shape or previous processing.

Instead of coating the steel with a layer of phosphates, cromodizing changes the steel so that the surface currents that induce rusting are stopped. Steel products are dipped in a bath or sprayed with a solution of the chemical. Only one minute is required for this treatment. Less care is necessary in the preparatory cleaning.

By changing the surface instead of coating it, cromodizing has the advantage of forming a protection that is as flexible and as ductile as the steel itself. Cromodized steel has the effect of oxydizing the lower part of the finished film of paint, forming in effect a cement that firmly binds the paint to the metal.



A hydraulic pump built into the bed furnishes feed pressure for the saw blade. A dial shows the cut pressure, acts as a guide to the operator at all times



Weldon End-Mill Sharpening Fixture

An end-mill sharpening fixture, claimed to have time-saving advantages in set up with unusual ease and simplicity of operation, is being manufactured by the Weldon Tool Co., 321 Frankfort Ave., Cleveland, Ohio. Originally designed for use in the company's own plant for fast accurate production sharpening, the fixture is also well adapted to general reconditioning needs in the average machine shop.

Adaptable to all types of fast steep spiral end mills as well as slow spiral types, the fixture will handle left- and right-hand spirals and cuts with equal facility.

No centers or lead cams are necessary. The principle used consists of a rocking head which permits an end mill to be moved away from the wheel during grinding without changing the machine setting, and a guiding finger contacting the inner side of the flute in such a way that it revolves the mill only when the cutter is rotated against the spiral. Since the guide finger itself is mounted on the rocking member, there is no risk of its losing contact with the flute. Only a single pass is needed in order to produce uniform and accurate back-off.

The guiding finger is fully adjustable for all sizes of straight shank end mills from ¼ to 2 in. flute diameter. Extra bushings can be supplied for handling taper shank mills if required.

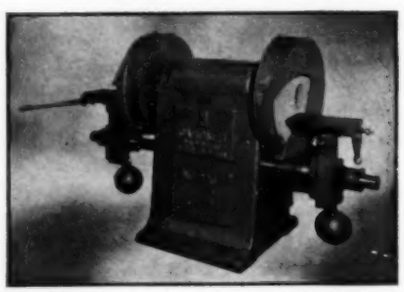
Gardner 200 Series Disk Grinders

The "200" Series grinders, announced by the Gardner Machine Co., Beloit, Wis., were developed for two main purposes; first, to provide a line of motor-driven tools each powered by a standard motor mounted on a bracket at the rear of the base, rather than by a special built-in motor; and, second, to offer a number of improvements in design, and increased sturdiness and weight. An important feature of this series is the possibility of controlling the spindle speed to give the proper peripheral speed of the grinding wheels.

Large, high-carbon steel spindles are mounted in two cartridges or pillow blocks, each of which carries two oversized pre-loaded ball bearings. One cartridge is clamped in position, and the other is allowed to float endwise, to take care of spindle expansion and contraction.

Bearing caps are removable, thus facilitating belt replacement. When the bearing cap is removed, the entire spindle, together with the bearing cartridges, may be lifted out.

Drive motor is mounted on a swinging motor plate mounted on the rear of the base. This swinging plate or bracket is provided with screw adjustment to regulate the tension of the multiple V-belt. Standard universal lever-feed tables or plain wood tables are available for the "200" Series.



The Round Table

EXTRA DIVIDEND

"Looks like we'd had a pretty good year, Al. Any reason why we shouldn't have a nice, fat dividend?"

"Yes, Ed, it's been a good year—the best since we started. And we've earned a nice piece of change so there'll be a dividend all right."

"But why not an extra dividend, Al? The last figures I saw showed a mighty nice bank balance. There's no need to keep it all lying idle in the bank. Better let us stockholders put it back into circulation."

"It's true there's a nice balance, Ed. But just remember that we haven't made up our depreciation figures yet. We're going to need some new machines next year, you know."

"Depreciation figures don't mean much to me, Al. Mostly a way of cutting down the taxes you have to pay. Depreciation on some of our machines can't be very much. They didn't cost us much."

"Too many depreciation figures are just what you say, Ed. Just made to reduce taxes—and that's what ails a lot of shops. They've paid dividends out of money that should have been tucked away to buy new machines."

"But we aren't likely to need many new machines next year. I don't like the idea of having all that money lying around loose."

"It won't be idle, Ed. We'll put it into good bonds, probably government bonds. Then we'll have it when we need more equipment."

"Government bonds pay such low interest, Al. Can't you do better than that if you insist on keeping the cash instead of distributing it?"

"I know they pay low interest, Ed, but I don't know anything else quite as safe. As long as the government lasts they are O.K. If it busts no bonds are of much use.

"You seem to forget that when we have to buy new machines they are going to cost us a lot more money than these did. By that time we'll have to get new ones. So I figure we better charge off all we can as depreciation now."

"You can't depreciate a machine more than it cost. Even if you did buy it at a bargain, and most of ours were bargains."

"The problem is, Ed, to have enough money to buy what we need, when we need it. If we can't call it 'depreciation' we can tag it as a 'reserve.' But we've got to have it where we can get it."

"I still want that extra dividend, Al. Why not let us use the money till you need it, then make an assessment on the stockholders?"

"We'd stand a fine chance of getting money for new tools after you'd spent yours for new radios, fur coats and automobiles. No, Ed, it stays right in the treasury."

Should a company keep a good surplus over and above its depreciation reserve? Or should it put money back into circulation by way of its stockholders, as Ed suggests?

DISCUSSION

Five-Day Week

Provided the hours worked are the same as in the six-day week, as much or more work will be turned out in the five-day week. The five-day week is a paying proposition for the shop owner, as it saves the cost of power for one day in the week the year around and the heating for one day in the winter months. The six-day week was fixed when the normal hours of work were 60. If the five-day week had been adopted under those conditions, men would have been working twelve hours per day, with the result that they would have been fatigued before the day was over and the output for the last two or three hours would have fallen off considerably.

Ed's reluctance to accept a proposal from the men is difficult to understand. It undermines the foreman's or the owner's authority in no way, nor does it reflect on their ability.

—W. E. Warner,
Kent, England.

There should not be any drop in production due to working a five-day week of 40 hours instead of a six-day week with the same number of hours. On the contrary it may help to increase production by making the men more satisfied. Since there is always more or less time lost at starting and quitting, it may help there also as one each of these periods will be eliminated. A little confusion may be caused in the shipping room at first, due to the shop being closed on Saturdays, but that matter can easily be worked out.

Ed is showing poor judgment in criticizing Al for granting the men's request in this matter. It is this readi-

ness on the part of management to talk things over with the employees and to grant any reasonable requests that has helped to bring industry where it is today.

A shop that takes the attitude that all ideas must originate with management, or one that will not grant the employees a reasonable request, especially when it does not cost anything, generally will have more or less labor trouble, and in time it will fall behind other concerns that have more progressive ideas.

—THOMAS M. GARRY,
Foreman-Instructor,
Yale & Towne Apprentice School.

Assuming that the hours worked in Al's shop during the six-day week were Monday to Friday inclusive, from 8 a.m. to noon and from 1.30 p.m. to 5 p.m., and on Saturday from 8 to 11 a.m., making a total of 40½ hr. The five-day week proposed by the men would have a total of 40 hr. or ½ hr. less than the six-day week. Does it really happen that one-half hour's production is lost?

In the six-day week there are twelve starts and stops against ten in the five-day week. If the men lose 5 min. at each end of the working periods through putting on and taking off overalls, washing hands or cleaning machines, 60 min. would be lost in the six-day week against 50 min. in the five-day week.

Power curves show that the power taken by machines falls off during the last ten minutes of the working period and does not come up to full load until about ten minutes after the works have started. By cutting out the sixth day, 20 min. of power production will be saved and the power losses due to machines running right will be proportionately less.

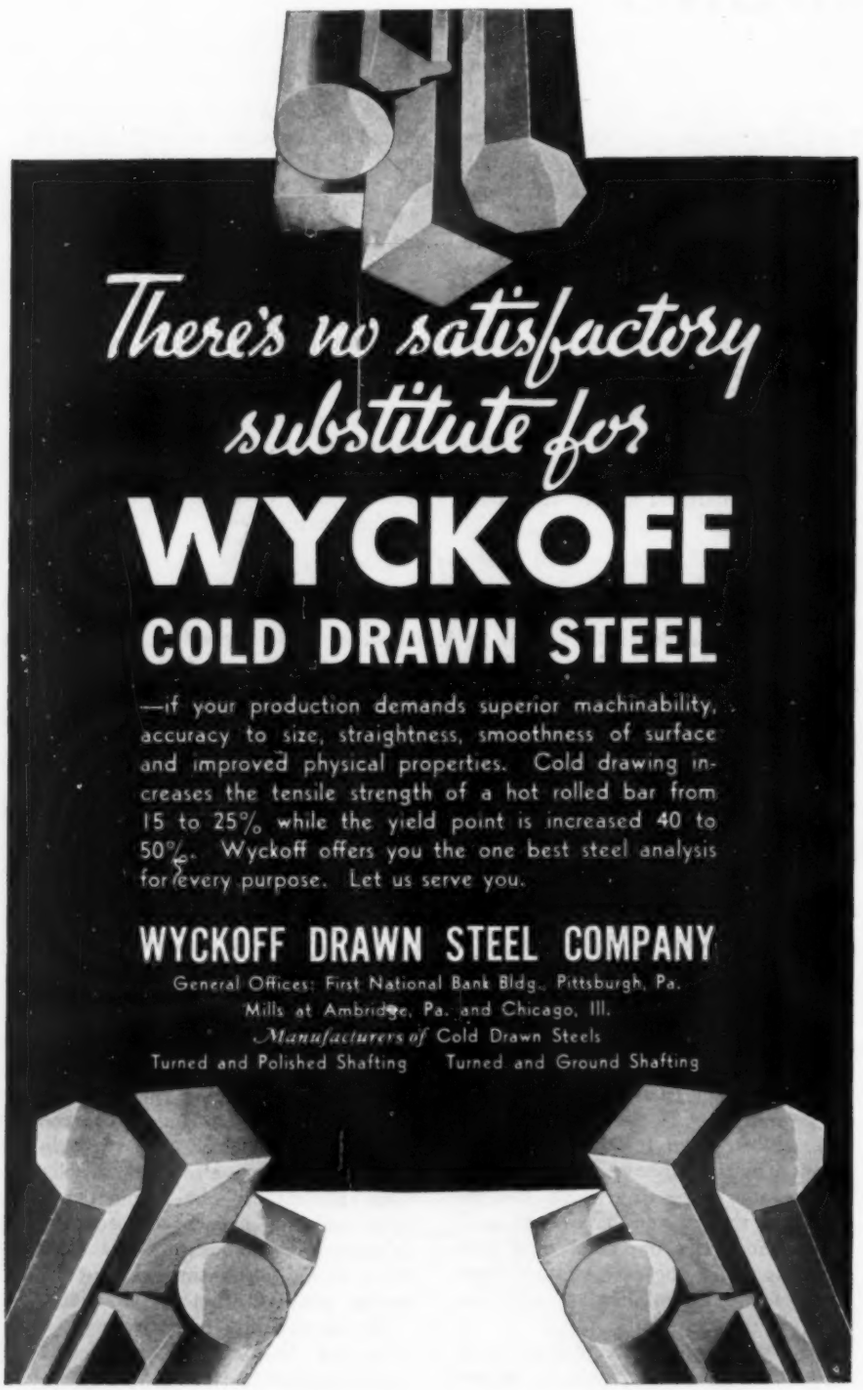
On the whole, Al will do wisely to consider the plan of working his men five days a week instead of six, and he will have a happier and more contented set of workers.

—D. MACLAREN CATHCART,
Erdington, Birmingham, England.

So far as the pure question of following a suggestion by the men is concerned, as against the same idea originating with the management, either Al or Ed might find themselves in deep water as a result of following their ideas too far. A careful balance in consideration of the men's suggestions, as against retention of full authority by the management, is undoubtedly the better goal toward which one may strive.

There are times when graceful yielding is by far the most profitable, and there are times when yielding would be ruinous. Some workmen will take advantage of any show of leniency; others are fair in this respect, but will become morose and resentful if their fairness is not recognized, especially if the management methods smack strongly of the iron hand. Serious trouble may be a by-product of either extreme pig-headedness or leniency.

There are other factors that may be considered to some extent with profit. The shorter week reacts favorably on lighting and heating costs during the winter months. A rush order may develop on days when the shop is closed and there may be loss of orders as a result of the five-day week. Bringing this fact to the attention of the men, especially in custom shops, will in most cases make them willing to make some provision for meeting such emergencies. —JOHN E. HYLER.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Mills at Ambridge, Pa. and Chicago, Ill.
Manufacturers of Cold Drawn Steels
Turned and Polished Shafting Turned and Ground Shafting

TRADE PUBLICATIONS

ALLOYS. Analysis and characteristics of Nichrome and other nickel and chromium alloys are presented in a catalog issued by the Driver-Harris Co., Harrison, N. J.

APPRENTICE TRAINING. A brochure entitled "Navy Yard Apprentice Training" has been published by L. Q. Moss, Instructor-in-Charge of Related Subjects, Philadelphia Navy Yard Apprentice Association, Philadelphia Navy Yard, Philadelphia, Pa. Those desiring copies may obtain them from the author. Price, 15 cents.

ARC WELDING EQUIPMENT. The Lincoln Electric Co., Cleveland, Ohio, has published two well illustrated catalogs describing automatic arc welding by the "electronic tornado" and the company's line of electrodes and accessories, respectively.

BALL BEARINGS. "Super Precision Ball Bearings for Spindles," a comprehensive discussion of the bearing problems of machine spindles, has been prepared by the Fafnir Bearing Co., New Britain, Conn.

BEARINGS. A wide diversity of applications of precision, ball, roller and thrust bearings is shown in a catalog issued by the Norma-Hoffmann Bearings Corp., Stamford, Conn.

CANADIAN MACHINERY TRADE. A report entitled "Canadian Machinery Trade—1934" has been compiled by Assistant Trade Commissioner, A. B. Peterson, Ottawa. Copies are available from the Machinery Division, Bureau of Foreign and Domestic Commerce, Washington, D. C. Price 10 cents.

CRANK SHAPER. A six-page folder, Bulletin 332-S, put out by the Hendey Machine Co., Torrington, Conn., presents the company's 32-in. crank shaper.

CUTTING TOOLS. The "Firthite Sintered Carbides" book, announced by the Firth-Sterling Steel Co., McKeesport, Pa., presents the company's line of carbide cutting tools. Various types of tools are illustrated, and dimensions and price lists are included.

SHEARS. The Canton Foundry & Machine Co., Canton, Ohio, has published a catalog describing its line of all-steel alligator shears. Several sizes of machines are illustrated and specifications are given for all.

DUO-METALS. The Latrobe Electric Steel Co., 40 West 40th St., New York, N. Y., has issued a pamphlet describing its line of DUO metals, clad metals produced by a new welding project. Photomicrographs illustrate the various types of welds and metals used.

FRICTION MATERIALS. A catalog of J-M industrial friction materials of both flexible and rigid styles has been published by Johns-Manville, 22 E. 40th St., New York, N. Y.

GASKETS. Goetze Gasket & Packing Co., Inc., New Brunswick, N. J., has issued Catalog 48 on metallic and semi-metallic gaskets, sheet and stuffing box packings, sealing compounds, gasket cutting tools, valve disks, filter screens and metal stampings. This 54-page booklet describes many new gasket types and is well illustrated with half-tones and blueprint diagrams.

GOGGLES. The American Optical Co., Southbridge, Mass., N. Y., has compiled industrial eye protection Catalog No. 35. It describes the company's complete line of goggles and states "How goggles may be used to cut production costs."

● *At Right:* Natco multiple spindle drill, Oilgear Fluid Power Feed equipped.

NEW FLUID POWER FEEDS

•

100 to 600% More
Rapid Traverse Speed

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Compensated
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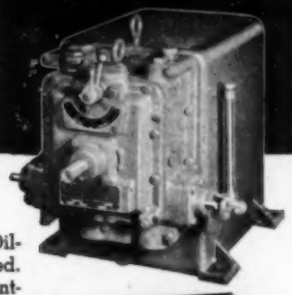

● *Above:* A new Oilgear Fluid Power Feed. Note: Flanged mounting, as integral machine part . . . Inside pump, eliminating hazard and bettering appearance . . . Self-contained; auxiliary valves, tubing, etc. are integral with pump . . . Many other exclusive features.

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MACHINES LIKE THIS—which is machining crank shafts for the main bearings—give lower unit cost of operation with Gulf lubricants in service.

GULF LUBRICANTS Help Maintain Fixed Unit Costs for Operations

BUSY machine shops and metal working plants are placing this one big responsibility on lubricants today: *They expect the lubricant to help them maintain continuous operation and fixed unit costs.*

That is why it pays to have a Gulf engineer survey your equipment carefully and recommend the lubricant which is exactly right for each job. The cost of oil and grease for a machine may be a small item, but a delay of only a few minutes—due to faulty lubrication—may play havoc with your operating schedules and your cost sheet.

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RADIO ANNOUNCEMENT: Enjoy Gulf's new radio program featuring Phil Baker in "The Great American Tourist" over CBS Sunday evenings 7:30 E.S.T.